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Hilda Hanway

Courage

WE MUST face life with confidence. We must believe that all is well; we must believe, with Socrates, that 'to the good man no evil thing can happen'. It will help us to endure whatever we have to face.

"We must seize our opportunities with eagerness and zeal; we must be willing to run the risk of taking chances. We must not turn back when we come to stony ground; we must not wince if life is not a bed of roses. Men have borne the heat of the day for us; men have suffered agony and died, that life for us might be enriched. We live in a free land because in other days men fought to make their country free with the courage that has written their names in letters of gold across the pages of history; and shall we fail our country now? Shall we be unworthy of the glory that is ours?

"Let us hold fast, let us stand firm; let us be strong and of good courage."

(See page 907)

COURAGE

COMPTON'S PICTURED ENCYCLOPEDIA

VOLUME 2

*To inspire ambition, to stimulate
the imagination, to provide the
inquiring mind with accurate
information told in an interesting
style, and thus lead into
broader fields of knowledge—
such is the purpose of this work*

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HERE AND THERE in Volume Two

At odd times when you are just looking for "something interesting to read," without any special plan in mind, this list will help you. Divided as it is into broad groups, it offers a fascinating variety of subjects for selection. With this as a guide, you may wander through storyland, visit far-away countries, meet famous people of ancient and modern times, review history's most brilliant incidents, explore the marvels of nature and science, play games—in short, find whatever suits your fancy of the moment. This list contains, however, only a small proportion of the articles in this one volume, and is not intended to serve as a table of contents, an index, or a study-guide. For these purposes consult the Fact-Index and the Study Outlines in Volume Eight.

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KEY TO PRONUNCIATION

Pronunciations have been indicated in the body of this work only for words which present special difficulties. For the pronunciation of other words, consult the Fact-Index in the last volume. Marked letters are sounded as in the following words: *cāpe, ăt, fär, fȧst, swạt, fa̤ll; mē, yĕt, fẽrn, thêre; īce, bĭt; rōw, nŏt, fôr, wȯn, do̤; cūre, bŭt, düne* (French *u*), *rṳde, fụll, bûrn; ḡo, ġem, cañyon, Jeaṅ,* (nasal); ɢ = German *g* (guttural); ᴋ = German *ch* (guttural).

BROWNING, ROBERT (1812–1889). Although he has been called "the scholar's poet," and not without good reason, no poet was more intensely alive and human than Robert Browning, nor felt more keenly the joy of life and living.

Browning's life was happily free from poverty. His father, a man of strong literary and artistic tastes, encouraged the boy in his love for books and art and music. Given the run of his father's great library, in his boyhood home at Camberwell in the outskirts of London, he read not only Byron and Shelley and Keats, but many books far beyond his years. Before he could write he had begun to compose verses, and by the time he was 12 he had already completed a volume of poems. His first published poem, 'Pauline', appeared when he was 21.

THE BROWNINGS IN THEIR BELOVED ITALY

"Open my heart and you will see engraved inside of it 'Italy'," wrote Robert Browning to tell of his love for that sunny Mediterranean land. Here we see a drawing of the poet and his poet wife, with their little son, Robert, on a trip through the Grand Canal in a gondola in that most picturesque of all Italian cities—Venice. In the background we see the tall Campanile or bell-tower, and to its right at the water's edge the Ducal Palace. Behind the Palace are the domes of St. Mark's—all in one glorious group. Is it any wonder that they loved the city?

His meeting with Elizabeth Barrett was the beginning of the most beautiful romance in literary history. After their marriage in 1846, they went to Italy, and lived an ideally happy life there until Mrs. Browning died in 1861. Bearing his loss with steadfast courage, Browning turned to writing with even greater energy than before. Most of his time was now spent in England, with occasional visits to Italy. He died in Venice, not long after writing the lines which describe himself so faithfully:

One who never turned his back, but
    marched breast forward,
  Never doubted clouds would break,
Never dreamed, tho' right were worst-
    ed, wrong would triumph.
Held we fall to rise, are baffled to fight
    better,
  Sleep to wake.

Much has been said about the difficulty of reading Browning. It is true that he is often obscure. He is so filled with the thoughts he wishes to express that he is not always so careful as he might be about the form, and sometimes these thoughts are too profound or too subtle to be expressed with exactness. Many of his poems are crowded with allusions to the out-of-the-way information which he picked up in his reading, and which means nothing to the ordinary reader. Probably the most obscure of all his works is 'Sordello', of which Tennyson said that there were only two lines he could understand, the first, "Who will may hear Sordello's story told," and the last, "Who would has heard Sordello's story told,"—and these, he jokingly remarked, were both lies. But this will not frighten you, if you know the delightful 'Pied Piper of Hamelin', the rollicking 'Cavalier Tunes', and such stirring ballads as 'Hervé Riel', and 'How They Brought the Good News from Ghent to Aix'. Among the poems which carry a deeper message, and which thoughtful boys and girls will appreciate and love more and more as they grow older, are 'Pippa Passes', 'The Boy and the Angel', 'Evelyn Hope', 'My Star', 'One Word More', 'The Lost Leader', 'Saul', 'Rabbi Ben Ezra', and 'Prospice'.

Browning's longest, and, as many think, his greatest, work is 'The Ring and the Book'. This poem, suggested by an old yellow book which he picked up in Florence, tells the story of a murder from 12 different points of view. It shows Browning's wonderful ability to reveal character from within and to see through the eyes of others. This power of "psychological analysis," as the critics call it, would have made Browning a great dramatist, had he not been too much concerned with the inner workings of the mind and too little with outward acts for a successful playwright. Some of his dramas, however, such as 'The Blot on the 'Scutcheon' and the historical play 'Strafford', are well worth reading.

Among Browning's chief publications are: 'Pauline' (1833); 'Paracelsus' (1835); 'Sordello' (1840); 'Bells and Pomegranates' (1841–46); 'Men and Women' (1855); 'Dramatis Personae' (1864); 'The Ring and the Book' (1869); 'Dramatic Idyls' (1879–1880); 'Asolando' (1889).

BRUCE, ROBERT, KING OF SCOTLAND (1274–1329). A fugitive lay on a bed of straw, heart-sick with discouragement. Idly he watched a spider hanging from its web and trying to swing itself from one beam to another of the wretched cottage roof. Six times the spider tried and failed. "If it tries again and is successful," said the fugitive to himself, "I too will make another attempt." On its seventh attempt the spider was successful.

This fugitive was the Scottish hero Robert Bruce, crowned king of Scotland after Wallace was defeated by the English (*see* Wallace, Sir William). Taking heart from the spider's success, he now won back one stronghold after another. At last on the memorable day of June 24, 1314, the English and Scotch forces met in the great battle of Bannockburn, which was to decide the fate of Scotland.

The great army of Edward II came pouring over the border. Bruce had not half so many men, but what he lacked in numbers he made up in courage and in skill. He chose a strong position. On one side flowed the little stream called the Bannock, with steep rocky banks; on the other rose Stirling Castle. In front were bogs and marshes, and wherever the land was firm, Bruce had pits dug to entrap the enemy's horsemen. The poet Robert Burns makes Bruce address his men in these ringing words:

Scots, wha hae wi' Wallace bled—
  Scots, wham Bruce has aften led—
Welcome to your gory bed,
  Or to victorie!

The skilled English archers were unsupported by the English cavalry and were forced to retire. When the mail-clad knights advanced they stumbled in the pits which the Scotch had dug for them, and found themselves helpless before the forest of leveled spears of Bruce's men. Presently from behind the Scottish ranks what appeared to be a fresh army was seen advancing. In reality it was only the servants, drivers, and other camp followers whom Bruce had sent behind a hill, and who now came forward to join the fight. The English were thrown into confusion, and the day closed with one of the bloodiest defeats they had ever suffered. Bruce's throne and Scotland's independence were thenceforth secure.

Bruce proved a wise king as well as a brave warrior, and during his reign (1306–1329) gained the title of "good king Robert." In his later years he longed to go to the Holy Land to fight against the heathen who were again in possession of the Sepulcher of Christ. He was the more anxious to do this because his soul was troubled at the thought that when a young man he had slain a rival before the very altar of God. When he knew that he must die without fulfilling his heart's desire, he called his faithful friend Lord James Douglas to him, and begged him to take his heart after death and carry it to the Holy Land.

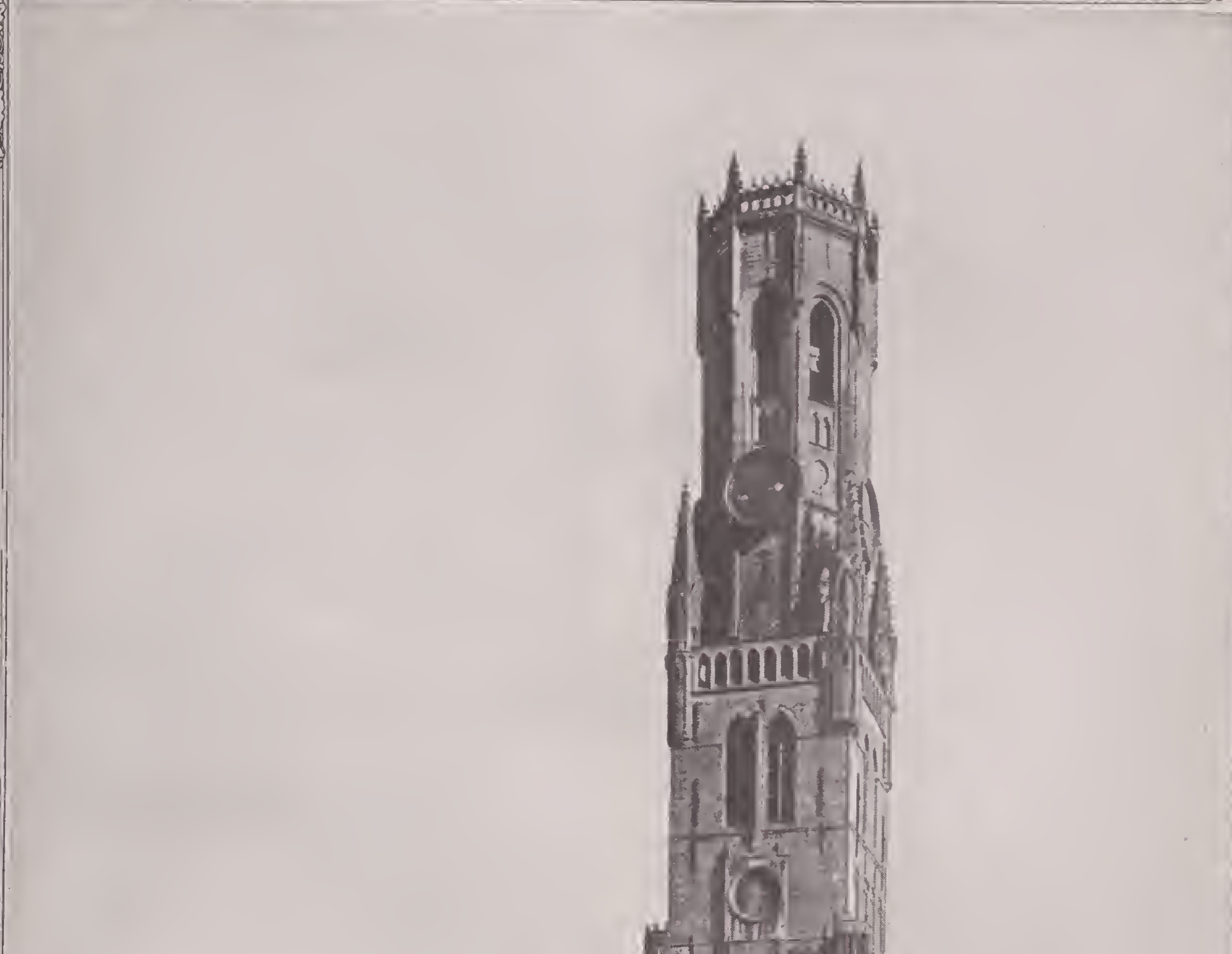
When Bruce died, Douglas put the king's heart in a silver casket and started with it for the Holy Land. In Spain he found the Christians hard pressed by the Mohammedans and went to their aid. In the heat of the battle he threw Bruce's heart into the midst of the infidel host, crying: "Go thou before as thou wert wont to do, and Douglas will follow!"

The brave Douglas perished in the battle, but one of his knights recovered Bruce's heart. Deeming that it had done full service against the infidel, he carried it back to Scotland, where it is buried in Melrose Abbey.

BRUGES (*brüzh*), **BELGIUM**. Quaintest of the many old Flemish towns is Bruges, which lies 55 miles northwest of Brussels and about eight miles from the North Sea. It is intersected and surrounded by many canals, which connect it with Zeebrugge its seaport, with Ostend, and with many other places. Crossing these canals are 50 bridges—all opening in the center to permit the passage of boats—and thus the city gets its name, Bruges, meaning "bridges."

In modern times this Venice of the North has dreamed peacefully of the days long past when it was one of the richest jewels in the crown of its sovereigns, the rich and powerful counts of Flanders—when its woolen trade flourished to such an extent that Philip the Good, in 1430, founded there the order of the Golden Fleece, in compliment to the growth of that industry. Tourists came from far and near to admire the monuments of that great epoch in its history—the beautiful Gothic church of Notre Dame (13th and 14th centuries), with its many art works and its splendid tombs of Charles the Bold and his daughter Mary of Burgundy, the old market hall with its famous chimes of 48 bells, and many other notable edifices. Other Flemish towns may have presented

THE GREAT BELL TOWER OF BRUGES



In the center of Bruges stands this old Market Hall, whose tower is one of the most famous in Belgium. It was built in sections, the lower part in the 13th century, the middle section in the 14th, and the top in the 15th. Its crowned peak rises 352 feet above the street, and concealed in these lofty walls is a chime of 48 bells, one of the most famous chimes in the world. Three times a week a program of musical selections is played. The summit of the tower, reached by a winding flight of 402 steps, commands a wonderful view of the city, and of the country stretching toward the sea, eight miles away, where stands the harbor of Zeebrugge.

an equally picturesque appearance, but none was so famous or so well studied and visited as Bruges.

Then in the summer of 1914 the Germans, as they swept across Belgium, occupied Bruges, bringing to the quiet old city an era of bloodshed and ruthless destruction, and leaving in ruins many of its treasures which can never be replaced. Zeebrugge, its port, became an important German submarine base, and there on April 22–23, 1918, occurred a successful British naval raid, intended to "bottle up" the German submarines, which has been called "the most thrilling and picturesque naval operation of the war." Population, about 52,000.

BRUSSELS, Belgium. Fittingly called "a little Paris," Brussels, the capital of Belgium, is one of the most beautiful and charming of European cities. It is a center of art and fashion, of industry and commerce, a modern well-kept city with many fine new buildings and other public improvements, yet with a few quaint and picturesque remains of bygone days. It has been the scene of many historic events in recent as well as in more distant times.

For four years following Aug. 20, 1914, Brussels lay under the heavy spell of the German occupation. The German authorities wrecked factories, seized machinery and tools, deported laborers to Germany, and requisitioned all raw materials. The city also had to pay heavy fines, the initial tax being $10,000,000.

Since the war Brussels has largely recovered from this industrial destruction. The manufacture of the famous Brussels lace, of carpets, furniture, and carriages, the printing of cotton and woolen fabrics, and printing and bookmaking are all again carried on extensively. There are sugar refineries, foundries of iron and brass, steam-engine factories, and many other industries. Brussels is situated almost at the center of Belgium, about 50 miles southeast of the North Sea. Its commerce has been promoted by a network of canals and railways that connect it with Antwerp and other Belgian cities, and with the ocean.

Like Paris, Brussels is a city of shaded boulevards, open spaces, and beautiful parks. The Grand' Place, or market place, is one of the most interesting public squares in Europe, being surrounded by many fine old buildings in marked contrast to the otherwise modern character of the city. The largest and most beautiful of these buildings is the Hôtel de Ville, or town hall, built in the Gothic style in the early 15th century. Its belfry, 370 feet high, is crowned with a statue of St. Michael, the city's patron saint, and the face of the building is richly adorned with statuary. Within its shadow Count Egmont and Count Horn, with other gallant patriots who took part in the uprising of the Netherlands against Spanish rule in 1568, were put to death by the ferocious Duke of Alva.

This square is in the lower city, now devoted mainly to manufacture and commerce. The upper town contains the great offices of state, and other public buildings, and the mansions of the ruling class. On the hillside is the cathedral of Sainte Gudule and Saint Michael, a noble specimen of medieval architecture, dating from the 13th century, with pointed Gothic towers and rich stained-glass windows. The Royal Library, the museums, and art galleries contain priceless treasures, including wonderful examples of Flemish art—by the brothers Van Eyck, Roger van der Weyden, Hans Memling, Rubens, and a host of other artists. Among the public buildings erected in modern times are the king's palace, the house of parliament, and the magnificent Palace of Justice (completed in 1883). The University, founded in 1834, is the most important of the city's many educational institutions, and is notable as almost the only university in Europe founded without the coöperation of either the church or state. Population of Brussels and suburbs, about 680,000.

Brussels (*Bruxelles* in French, the official language) was founded, according to tradition, in the 6th century, and received its name (*broek* means "marsh") from the nature of the site. Its growth was slow until the days of the Burgundian dukes in the 15th century, when it became one of the important cities in the Netherlands. It was the scene of the first rising of the Netherlands against Spain (1566), but remained under Spanish rule after the Dutch Netherlands had made good their independence. It passed to Austria in 1713, following the wars of the Spanish Succession. After a brief period of French rule during the French Revolution and the First Empire, it, with other parts of Belgium, was incorporated with Holland into the Kingdom of the Netherlands. In 1830 Brussels was the chief center of a revolt which separated Belgium from Holland, and it has since (except during the German occupation, 1914-18) been the capital of the Belgian kingdom.

BRYAN, William Jennings (1860–). Although he was three times defeated for the presidency of the United States, William Jennings Bryan molded public opinion as few of our presidents have done. For many years he was the leader of the Democratic party, and it was his influence that won the Democratic presidential nomination for Woodrow Wilson in 1912.

Bryan was born and educated in Illinois and practiced law there until 1887, when he moved to Nebraska and speedily made a reputation as one of the foremost orators of the day. In 1890 he was elected to Congress, where he was at once placed on the ways and means committee, an honor that is usually reserved for those who have served in the house for years.

Six years later, at the age of 36, Bryan achieved national fame, and received his first nomination for the presidency, when he swept the national Democratic convention off its feet by an impassioned appeal for free and unlimited coinage of silver in the ratio of 16 parts of silver to 1 part of gold. Turning to those who wished to keep gold as the money standard, he exclaimed: "You shall not press down upon the brow of labor this crown of thorns. You shall not crucify mankind upon this cross of gold."

Though Bryan failed of election then, and again in 1900 and 1908, he was still regarded as the leader of the party. By his weekly—later monthly—paper called *The Commoner*, and by the lectures which he delivered from Chautauqua platforms in all parts of the country, he did much to advance the cause of prohibition, of religion, and of morality. In the national convention of 1912 he opposed the reactionaries.

He was appointed secretary of state by President Wilson, and while in office he negotiated treaties with 30 countries, representing three-fourths of the world's population, for the international investigation of disputes before resorting to war. So strong was his opposition to war that, in June 1915, he resigned from the cabinet as a protest against the President's firmness in pushing the *Lusitania* matter with Germany. When the United States finally entered the war, however, Bryan supported the government's war measures, declaring that "the quickest road to peace is through the war to victory."

BRYANT, WILLIAM CULLEN (1794–1878). In 1811 a 17-year-old boy of Cummington, Mass., was musing one day about the great facts of life and death. His musings naturally fell into metrical form, for he had been writing verses before he donned long trousers. Later his father, a country doctor, sent the poem to the editor of the *North American Review*. It was published in 1817 and won instant fame for the writer.

The poem was 'Thanatopsis,' the first great poem written by an American, and the writer was William Cullen Bryant, "father of American poets." At the age of 10 this young prodigy had published a poem in a country newspaper and at 14 he prepared a collection of poems which was put out in book form and soon ran into a second edition. This was 'The Embargo', a political satire criticizing the policy of President Jefferson, which attracted wide notice.

The publication of 'Thanatopsis' marked an epoch in American letters. In the early days of the Republic its readers were slavish imitators of English patterns. 'Thanatopsis' was the first genuinely American poem, based on independent and original thinking and inspired by our own American landscape.

Bryant had, of course, read the English poets and had admired some of them intensely. Those to whom he felt most akin were Cowper, Coleridge, and Wordsworth, because they too loved nature. And yet he could read their poems without copying their ideas and forms. He wrote 'Thanatopsis' in a noble, rolling rhythm all his own, and he took Nature as he found her—austere with a dignity that made even death sufficiently beautiful and inevitable to make him scorn the man who feared it.

It is Bryant's poetry that raises his head above the crowd, and yet original verse occupied a very small part of his days. He studied law as a boy, but did not practice it long. For fifty years and more he edited the New York *Evening Post*. America, as E. C. Stedman says, "called for workers, journalists, practical teachers. If after accomplishing their daily tasks they found time to sing a song, it thanked them and did little more." When it is remembered that Bryant wrote several books of travel, and made many public speeches, translated Homer's 'Odyssey' and 'Iliad' into blank verse, and edited an extensive American history in addition to his newspaper work, it is not astonishing to find that his original verse filled only a few thin volumes.

Among Bryant's most famous poems are 'Thanatopsis', 'To a Waterfowl', 'A Winter Piece', 'The Death of the Flowers', 'Song of Marion's Men'.

The 15*th* PRESIDENT *of the* UNITED STATES

BUCHANAN, JAMES (1791–1868). The 15th President of the United States was a man who held almost every honor which the American people could give him, and yet he retired from public life under a cloud of deserved rebuke, such as has seldom fallen upon a president of our country. He once referred to himself as an "old public functionary"—which was an apt name, for he was in public office almost continuously from the time he was 23 years old until his retirement from the presidency at the age of 70.

Buchanan did not have to fight his way in life by his own efforts, as did Lincoln; nor did he, on the other hand, have such able assistance as did John Quincy Adams. His family belonged to the great middle class of American people. They were Scotch-Irish, who had settled near Mercersburg, Pa., in the latter part of the 18th century. His father was a merchant as well as a farmer, and in these two callings he made enough wealth to maintain his large family in comfort. His son James gives this account of his own education: "After having received a tolerably good English education, I studied the Latin and Greek languages at a school in Mercersburg. I was sent to Dickinson College in the fall of 1807, where I entered the junior class. The college was in a wretched condition, and I have often regretted that I had not been sent to some other institution." After graduation Buchanan studied law and was admitted to the bar in 1812. Two years later he began his public career as a member of the Pennsylvania state legislature.

Buchanan and the War of 1812

At that time the country was engaged in its second war with England, a war which Buchanan, as a Federalist, had opposed before it was declared, but afterwards urged the people to support. He himself volunteered to help defend Baltimore, but he was never called into active service. That he never approved of the war is shown by a speech which he made after peace was declared, in 1815, in which he stated that it had been "glorious in the highest degree to the American character, but disgraceful in the extreme to the administration."

Before Buchanan was elected to the legislature, his father was doubtful of the advisability of his entering politics, urging that it was better "to be an eminent lawyer than to be part lawyer and part politician." Buchanan disregarded this advice, and he soon became an eminent politician rather than part lawyer and part politician. Besides serving in the state legislature, he was a member of both houses of Congress, where he was a strong supporter of Jackson; was minister to Russia, in which capacity he negotiated our first commercial treaty with that country; was minister to England; and was secretary of state under President Polk. In this last position he had a part in the negotiations by which we secured the southern half of the Oregon country, and the vast territory in the southwest from Mexico. He was heartily in favor of the annexation of Texas, and this, together with his share in the Ostend Manifesto, in which he favored the acquisition of Cuba, led to the charge that he was a pro-slavery man.

How He Got to be President

Fortunately for his future political career, he was serving as minister to England at the time of the passage of the Kansas-Nebraska Act, and so was not involved in the quarrels over that bill. This made him an available candidate for the Democratic nomination for the presidency in 1856. Combined with his national reputation as a statesman, it rendered his election certain over Fremont, the Free-Soil candidate.

Buchanan was 66 years old at the time of his inauguration—the oldest president, except William Henry Harrison, that the country had had. And at this advanced age he was called upon to face some of the most serious problems which have ever confronted a ruler. It is no wonder if at his age he attempted, in a feeble way, to avert—instead of meeting—the conflict which threatened the country.

JAMES BUCHANAN

BUCHANAN'S ADMINISTRATION (1857-61)

Dred Scott decision (1857).
First Atlantic cable laid (1857).
Lincoln and Douglas debates (1858).
Oil discovered in Pennsylvania (1859).
John Brown's raid on Harper's Ferry (1859).
Oregon, Minnesota, and Kansas admitted as States (1858, 1859, 1860).
South Carolina secedes (December, 1860).
Other Southern States secede and form the Confederacy (1861).

Civil war was already raging in Kansas, where slave-state and free-state men strove to secure possession of the state government. Buchanan was impressed by the threats of secession uttered by fire-eating Southerners, and urged Congress to admit Kansas under the Lecompton constitution, which allowed slavery. He declared that Kansas was as much a slave state as was South Carolina or Georgia; but Congress did not agree with him, and consequently Kansas for the time was kept out of the Union.

Buchanan and the Slavery Question

His next attempt to pacify the South was his efforts to win acceptance for the Dred Scott Decision as a final settlement of the slavery question. This also was a failure, for the whole North, even to Stephen A. Douglas, refused to agree with Chief Justice Roger B. Taney and the majority of the Supreme Court.

These questions were serious, and Buchanan's handling of them failed to satisfy the North. But they were insignificant when compared with the crisis of 1860, between the election and the inauguration of Abraham Lincoln, as a Republican President on a platform opposed to slavery extension. President Buchanan's efforts to please both sides were even more pitiable at this time than before. He declared on the one hand that a state had no right to withdraw from the Union; but in the same message to Congress he said that there was no way to prevent a state from seceding if it wanted to, for the constitution did not give the national government the right to make war on a state. His acts were as contradictory as his words. At first he did nothing to uphold the Union. He had followed for so long the dictates of the Southern leaders that he lacked the courage to oppose them in this critical time. After the resignation of the Southern members of his cabinet, he was induced to send a steamship to Charleston, S.C., with supplies for Major Anderson at Fort Sumter. But the expedition was not allowed to land, and Buchanan made no other attempt to relieve the fort—leaving it to Lincoln, the incoming President, to manage the situation. War supplies were allowed unchecked to fall into the hands of the seceding states. Buchanan blamed the Republicans of the North for the war, because they refused to abide by the Dred Scott Decision and to enforce the Fugitive Slave Law. Also, he was anxious that it could not be said that war between the states had been started by a Democratic President.

Buchanan's policy was generally condemned in the North, and he was called "the most perfect imbecile that ever held office." It is no wonder that he said to Lincoln on March 4, 1861, "If you are as happy to come into the White House as I am to leave it, this is certainly the happiest day of your life."

This was the end of Buchanan's public career. He retired to his farm near Lancaster, Pa., where he died seven years later. He is the only President who lived and died unmarried. His last years were spent in trying to justify his actions while president, the books embodying his defense bearing the title, 'Mr.

Buchanan's Administration on the Eve of the Rebellion'. Though he upheld Lincoln and claimed that the war had been forced on the North by South Carolina and the Secessionists, he still maintained that as President he could not have acted otherwise than he did. No one today approves of the charge that Buchanan was "a traitor to his country," which was made before he retired from office; nevertheless he is still regarded as probably the least successful president that the country has ever had.

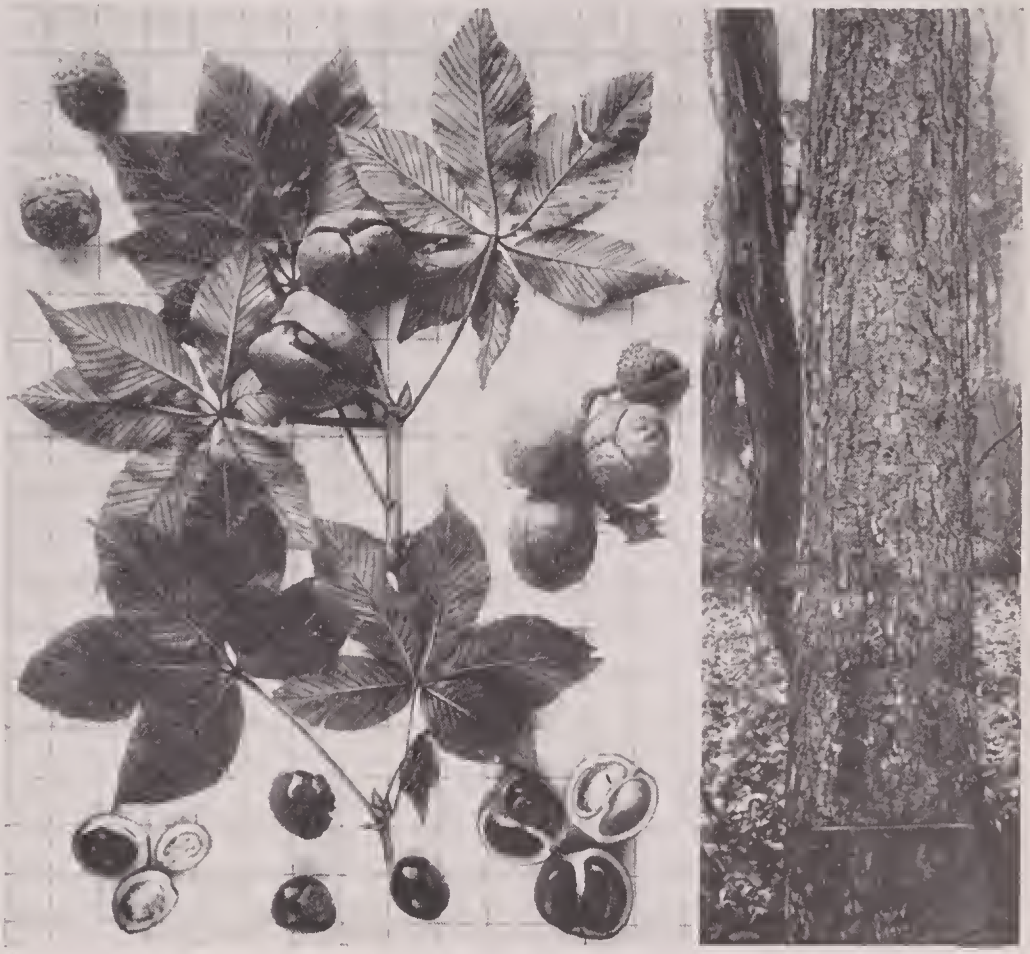
BUCHAREST', RUMANIA. "The City of Joy" is, according to a legend, the meaning of the name of this Rumanian capital, which is situated about 30 miles north of the Danube River. Present-day inhabitants, however, prefer to call their city "the Paris of the East," because of its wide avenues and because they regard it as the fashion center of eastern Europe.

Bucharest presents some picturesque aspects not found even in Paris. Above its magnificent public gardens tower metal-covered turrets and gilded cupolas. Along some streets there still stand quaint old one-story houses covered with plaster and ornamented with brilliant oriental figures. In these sections, too, are to be seen the gay colorful costumes of the Rumanian peasants, and East and West meet on the streets of the city. Oriental costumes and customs are frequently met with, although on the whole Bucharest has adopted Western civilization. Its streets are broad, well paved and lighted, and traversed by numerous electric cars. Manufactures are still in their infancy, but Bucharest is a busy commercial city. As the trade-center of Rumania it exports petroleum, cereals, timber, hides, and honey. Schools are numerous in the city and the University of Bucharest is regarded as one of the best in eastern Europe. It is free to all students.

Like the rest of the Balkans, Bucharest is war-worn in its struggle for existence. For years Rumania was held by the Turks, as the provinces of Moldavia and Wallachia; but it became independent and united and in 1862 Bucharest was made the capital of the new kingdom. On Aug. 10, 1913, it was the scene of the signing of the Treaty of Bucharest, which closed the war of the other Balkan states against Bulgaria. Bucharest suffered during the World War through German occupation, which began Dec. 6, 1916, and lasted until the armistice was signed in 1918. Population, about 340,000.

BUCKEYE. So handsome and rapid of growth is the buckeye tree that in spite of a very disagreeable odor exhaled by the bark and leaves, it has been adopted as an ornamental shade tree in all sections where it will grow. The trees are unusually tall, with slender branches, and the broad five-fingered leaves grow in umbrella-like clusters, covering the tree with dark luxuriant foliage. Throughout the year the buckeye is a favorite with children. In the spring the snowy white and yellow flower clusters are a source of delight and in the summer they play in the tree's cool shade. In the autumn they gather up the glossy brown "buckeyes" as they drop from the prickly burrs; and in winter the large buds, folded away in capes of polished brown, hold a promise of spring's return.

THE TREE THAT NICKNAMED OHIO



At the right is the straight trunk of the Buckeye or American horse-chestnut. You can recognize these trees by the hand-shaped cluster of leaves, but still better by the smooth brown seeds in their round cases. These seeds may appear to be good to eat, but they are really bitter and mildly poisonous.

The wood of the buckeye has been found excellent for making artificial limbs, and quantities of it are used for paper pulp. The country people make soap from the sap, and from the nuts is manufactured a flour which is used to make shoemaker's and bookbinder's paste. The nuts are extremely bitter, if not poisonous. Ohio has been called the Buckeye State from the prevalence there of the common buckeye.

In the Alleghenies, as far south as Georgia, grows a species of the tree called the sweet or yellow buckeye. This lacks some of the disagreeable odor of the more common Ohio type, and the fruit is eaten by cattle. The flowers are yellow and showy. A red-flowered buckeye of small size grows wild in certain parts of the southern states. The English buckeye, which has been transplanted to this country, is often called by us the "horse-chestnut." It is a very large tree and has big clusters of white, pale yellow, or pink flowers. The wood is soft and pulpy and has no commercial value. Japan also has a species of its own, and yet another species grows on the Himalaya Mountains. The name "buckeye" is probably derived from the likeness which the smooth brown nut, with its light brown spot, presents to the eyes of a deer.

Scientific name of the common buckeye, *Aesculus glabra*. Flowers pale yellow, growing on short pedicels in close panicles. Leaves palmately compound, opposite and sharply serrate. Bark dark brown, separating into thin pieces.

BUCKWHEAT. When the first frosty days of autumn come, how delicious are the fresh buckwheat cakes, dripping with golden maple syrup and flanked with spicy sausages!

The buckwheat flour with which the cakes are made comes from the seed of the buckwheat plant, which is a native of Asia, but cultivated in most countries and to quite a large extent in the United States. Its name comes from the German word *Buchweisen*, meaning beechwheat, so called because of the resemblance of the three-sided grain or seed to the nut of the beech tree.

Buckwheat is cultivated in China and other eastern countries as a food plant, but in Europe it is used principally as stock and poultry food, although in France a dark heavy bread is made from buckwheat flour, and in Germany and Poland a buckwheat gruel is sometimes eaten. Buckwheat meal is baked into cookies as a dainty for Dutch children, and in the Russian army buckwheat groats are given out as part of the soldiers' rations, and are cooked with butter or tallow. The flowers of the plant are rich with honey, and buckwheat is sometimes grown by bee farmers. Buckwheat honey is dark and has a characteristic flavor very pleasing to many people.

Buckwheat is extensively grown in the United States east of the Mississippi, and from Pennsylvania northward. The three leading states in the order of their production are New York, Pennsylvania, and Michigan. Light well-drained soils are best suited to its production, but the plant is very hardy and grows well on poor soil with little cultivation. For this reason it has been called the poor farmer's crop, and the term "buckwheaters" is sometimes applied to unskilled farmers. Buckwheat is sown as late as possible to secure a crop before the severe frosts.

Scientific name, *Fagopyrum esculentum*. The plant has smooth branching stems, one to three feet high, green leaves with dark veins, and clusters of pale reddish flowers.

BU'DAPEST, HUNGARY. Few capitals of the world typify the life of the country as Budapest typifies the life of Hungary. As Paris is sometimes said to be France, Budapest may with even greater truth be said to be Hungary. In it centers the political, commercial, industrial, and intellectual life of the country, and its population reflects the various racial elements of the nation.

Situated on the banks of the Danube River, just where that stream makes a sharp bend to the south, the city is made up of the two old towns, Buda and Pest. The first was founded by the Romans in the 2d century A.D.; they, however, called the place *Aquincum* from the old Celtic name meaning "rich waters," which referred to the numerous mineral springs in the surrounding region. It was the Huns under Attila, in the 5th century, who, at the time of their settlement in the plains of the Danube, revived the names Buda and Pest, the meanings of which are uncertain. The former, on the right bank of the river, today straggles over a series of small steep hills, while Pest occupies the low flat plain on the left bank.

In the old section of the city (Buda) are the royal castle, the government offices, and the homes of the old Magyar or Hungarian families. The newer town of Pest is, on the other hand, the commercial and industrial center of the city. In it are some of the largest electric works in Europe, in which were planned the first successful underground trolley lines. Large flour-milling establishments are there, and factories for the making of machinery, chemicals, carriages, and cutlery. From its warehouses are shipped by rail or by the Danube the exports of the country—grain, wines, wool, cattle, and flour. It is believed that Pest has always been an industrial center, for the name is the Russian word for "oven" and probably refers to the great lime kilns which were formerly an important feature of the place.

In Pest, too, is located the University of Hungary, which has been so successful in its efforts to foster the language and literature of the Magyars or native Hungarians.

The progress of Budapest dates entirely from the 19th century. The union of the two towns, in 1873, did much to aid the cause of civic improvement, especially in the removal of slums and the reconstruction of the two towns. Population likewise increased rapidly. At the beginning of that century the two towns contained about 54,000 people. Before the World War of 1914–18 the population was 880,000, of whom nearly 600,000 were Magyars and 110,000 Germans, with the remainder a mixture of the various Balkan races.

Although Budapest was affected by disorders incident to the revolutions of 1918, it did not suffer as did some other cities. Even when the Bolshevists, under Bela Kun, gained possession of the city, progress in civic improvements continued.

BUD'DHA (about 568–488 B.C.). More than 500 years before Christ was born—and at about the same time when Confucius was founding the religion of the Chinese—a Hindu prince named Siddhattha Gotama became so famed in far-off India for his holiness and tender-hearted love for all creatures that he was called "the Buddha," or "the Enlightened One."

Many persons believed in his teachings while he lived. After his death temples were built in his honor and his religion spread through a great part of Asia.

What the Great Teacher Found under the Bo Tree

It would seem as if this young prince had at his command everything that his heart could wish—wealth and power, health and beauty, and a wife and young son whom he dearly loved. But his mind constantly turned from the pleasures and empty life of the court to the mysteries of life and death, of suffering and sin and sorrow. At length, at the age of 29, he fled from home and became a beggar. Through all sorts of penances inflicted upon his body he sought to free himself from evil and attain unto holiness. The solution—that ignorance is the source of all evil and of all desire—came to him while meditating in solitude under the bo tree, which the Buddhists call the tree of wisdom. Different religions and peoples throughout history have had traditions of such "enlightened ones" or inspired leaders. It should also be said that this state of enlightenment, of finding oneself free from worldly sin, was the aim of the medieval monks, as it is today of the various kinds of fakirs (fȧh-keers′) or ascetics that swarm in India and the rest of the Orient—who fast and perform useless penances, even when they are not (as many are) cunning imposters who live off the superstitious ignorant people.

TEMPLE OF BUDDHA IN A CAVE

The Bingyi Caves, about 50 miles from Maulmain in Burma, are favorite resorts of Buddhist worshipers. Here we see a group of Burmese women praying before two statues of Gotama Buddha. These are examples of the marvelous underground temples which are found in India.

When he had attained unto Enlightenment, Buddha cut off his hair and for 40 years preached up and down the valley of the Ganges. He found his fellow Hindus and their priests, the Brahmans, living worthless lives and not according to the Vedas or sacred books. Buddha taught that the three great sins are self-indulgence, ill will, and ignorance, and that by freeing oneself from all desire one gained a blissful state of abandonment of self called "Nirvana." He died about 488 B.C. near Benares, when 80 years old.

The Strange Doctrine of Transmigration

The followers of Buddha have a vast literature in the ancient language Pali, which records Buddha's discourses and conversations with his disciples. In recent times archeologists have dug up in India and deciphered many memorials of his life, one of them being a casket which contained a bone of the Buddha. His religion appeals to the oriental mind with its teaching that existence is in itself evil, and that the soul lives over and over again on earth—first in one person and then in another, at times even as an animal, insect, or plant—rising higher in the scale after each good life, and sinking lower with each evil one. For this reason Buddhists never kill animals or take life of any sort. As in their rival religion Jainism, which is closely akin, all space about the temples or pagodas is cleared of vegetation lest one should unknowingly tread upon some insect, such as an ant, which is the habitation of a soul. In India the Jains, a rich sect, go to the extent of supporting hospitals for injured or sick animals, which they buy and keep under their protection, and even hire poor natives to lie on beds that are infested with vermin, so the vermin can feed!

Buddhism preaches kindness to all living things and persons. There is no God in Buddhism, no Creator. There is no beginning and so no end, or, if there is an end, it is in nothingness or "Nirvana." Thus there is no hope of a heaven. We may profitably compare Buddhism with the religion of the Greeks, who represent the thinking West that prepared the way for Christianity. The Buddhists stand for self-repression, suppressing all one thinks or wants to do. The Greeks stood for self-expression, for action, and changing what is bad into the good.

India is no longer the chief numerical center of Buddhism, but pilgrims come as in ancient times from all parts of the Orient to visit the places sacred to Buddha. The religion, as practiced today, has become degraded and idolatrous, and its monks, as in Tibet, are often worthless imposters who live off the superstitious people. Its purest and most important home is in Ceylon. Altogether there are over a hundred million Buddhists in the world, chiefly in China, so that this belief still ranks as one of the great historic religions of mankind.

BUENOS AIRES (*bō′nos ā′rēz*), ARGENTINA. If you follow the golden highways of the world's commerce, you will find yourself before long sailing up the wide mouth of the Rio de la Plata, from the east coast of South America, and docking 165 miles from the sea in the harbor of Buenos Aires, the capital of the Republic of Argentina, and one of the wonder cities of the world. Around you will be moored or anchored scores of steamers, flying the flags of all nations. And spread out on the south bank of the river, more than

THE WONDER CITY OF SOUTH AMERICA

Buenos Aires, capital of Argentina, is one of the newest of the great cities of the world. In half a century it grew from a straggling cattle town to be the fourth largest city on the American continent. Unbounded wealth pours into it as a result of its vast commerce. Here is a general view of the older and more crowded residence district, which might easily be taken for a section of Paris or some metropolis of the United States.

30 miles broad at this point, you will see a great modern metropolis, 16 miles long and 12 miles wide, where a few decades ago there was only an old-fashioned unpaved cattle town.

Buenos Aires today is the largest city in the southern hemisphere, and the fourth largest on the American continents, ranking next to Philadelphia. Wealth and progress are the results here of the busy commercial spirit of the New World. The vast harbor system, constructed at a cost of $50,000,000, has opened the shallow river channels to the largest ships. Huge warehouses line the six miles of wharves, including the "Central Fruit Market," the largest warehouse in the world, occupying an area equal to nine New York City blocks. Through these storehouses pass more foreign goods than any other American gateway outside of New York City.

Beyond the wharves lies the city in all the magnificence of imposing new buildings, broad streets, beautiful parks, and handsome squares. The thoroughfares are alive with automobiles, street-cars, trucks, and all the signs of thriving industry. On the sidewalks before the glittering shop windows every language of the globe may be heard. On the news stands, beside papers in Spanish, will be found publications in English, French, Italian, Scandinavian, Russian, Hebrew, and Arabic. Indeed, the newspapers of Buenos Aires, as much as anything else, are gauges of the city's progress. The two largest, *La Nacion* and *La Prensa*, have the most extensive telegraph services in the world; and *La Prensa* is a most unusual institution. Its handsome building is dedicated to social service, and contains a library, free evening schools in commerce and music, offices for free medical treatment, free legal aid, and free chemical laboratory, etc.

A rapidly extending subway system burrows beneath the business district. The water system and sewers, built at a cost of $45,000,000, are unexcelled; with other sanitary measures they have rid the city completely of its former cholera and yellow fever.

Buenos Aires has many fine schools and technical colleges, and an excellent university with more than 4,500 students. The people are great lovers of drama and of music, and each year some of the greatest singers and actors in the world appear in the numerous and gorgeous theaters.

The great Plaza de Mayo is the center of the official life of the city. Here are the Casa Rosada (the Pink House) where the president of the republic lives, the 18th century cathedral of classic design, the National Bank of Argentina, and the immense House of Congress, built in 1906 at a cost of $6,000,000.

Buenos Aires draws its wealth from the vast cattle and farming lands of Argentina, which pour their products over the 22,000 miles of railways into this central point. The city contains one-fifth of the population of the republic. Its mayor is appointed by the president, and so has the power of the federal government behind him. This commercial and political centralization has brought prosperity and attracted foreign immigration and capital to the city, and it promises to maintain Buenos Aires as one of the most important trade centers of the world. Population, about 1,640,000.

BUFFALO. The true buffaloes—which must be carefully distinguished from our American "buffalo" or bison—are natives of India and central and southern Africa. The Indian buffalo is still to be found in wild herds, though as a rule it is domesticated. It is larger and more powerful than the ox, and because of its great strength and its ability to labor in wet ground its services are very highly valued. It is a very interesting sight to see this huge creature at work in the rice fields, head low down and nose thrust forward, steadily pulling the awkward cultivator through the flooded muck. It is fond of water and will stand for hours with only its head above the surface. The usefulness of this animal has carried it into Egypt and some parts of southern Europe. It is a terrible fighter when aroused and can generally worst a tiger with ease. The water-buffalo or "carabao" of the Philippines is a smaller variety of this species.

THE ANIMAL A TIGER FEARS

The wild Asiatic Water-Buffalo, such as those you see here peacefully bathing, are afflicted with very bad tempers. A wild bull Buffalo is more than a match for a tiger or an elephant, and will often attack men on foot or on horseback without provocation, yet the Buffalo for ages has been tamed, and is the principal draft animal in the fields of the Far East, and even in Egypt and southern Europe.

The Cape buffalo is found in southern Africa and is larger and fiercer than the Indian buffalo. Instead of long horns curving outward and backward, the Cape buffalo has short flat horns so thickened at the base as to form a helmet-like mass which makes the forehead almost invulnerable. This type has never been domesticated and is considered one of the most dangerous beasts of the jungle. Its skin is so tough that it is made into shields by the Kaffirs. Like the Indian type it is fond of water, and it frequents reedy swamps in large herds. A faithful bird friend, the buffalo bird, attends it everywhere, picks ticks from its hide, and gives warning at the approach of danger.

Scientific name of Indian buffalo, *Bos bubalus;* of the Cape buffalo, *Bos caffer.* Asiatic buffaloes are distinguished from the African forms by having the hair on the forepart directed forward.

BUFFALO, N.Y. The "Queen City of the Lakes" is the second largest city in New York State and the 12th largest in the United States. It is situated at the outlet of the Niagara River and the Buffalo River, at the eastern end of Lake Erie, and has about ten miles of lake and river frontage. It is 24 miles south of Niagara Falls.

The city's position on the Great Lakes, together with other transportation advantages, gives Buffalo its rank as a world port in the volume and variety of its shipping. The Welland Canal, 20 miles north of Buffalo, connects Lake Erie with the St. Lawrence River, and the New York State Barge Canal (Erie Canal) makes a continuous waterway from Buffalo to the Hudson River. The harbor in the mouth of Buffalo River, protected by an immense breakwater, is one of the best on the Great Lakes, and a new harbor has also been made by building a breakwater in Niagara River. Ferries connect the United States and Canada at Fort Erie, and the International Bridge connects Buffalo and Bridgeburg, Ontario.

Buffalo handles an enormous amount of flour, lumber, coal, and mineral ore in shipment and transshipment. The first grain elevator of the world was built here in 1845. There are now more than 20 immense grain elevators, with a capacity of about 30,000,000 bushels.

Buffalo has two great advantages as a manufacturing center—natural gas, piped from Pennsylvania and Canada, and cheap electric power from Niagara Falls. The principal industries are wholesale slaughtering and meat packing, foundry and machine shop products, flour and grist mills, the manufacture of linseed oil, railroad cars, soap and candles, planing-mill products, factory-made clothing, chemicals, patent medicines and compounds, leather and leather goods, furniture, carriages, automobiles, and confectionery.

The city is a pleasant place of residence, with a beautiful series of parks and drives in connection with which the Pan-American Exposition was held in 1901. Overlooking the lake at the mouth of the Niagara River is Front Park, situated on a bold bluff 60 feet high. Fort Porter, a military post of the United States, is located here. A beautiful marble shaft in Niagara Square honors the memory of President McKinley, who was shot in Buffalo while attending the Pan-American Exposition.

There are many beautiful buildings in the city, including Albright Art Gallery, an edifice of white marble, which houses one of the leading art collections of the country. The public school system is excellent and there are several colleges and seminaries, the most important being the University of Buffalo and Canisius College.

The town was incorporated in 1810. In December 1813 it was burned by the British and the Indians, but was rebuilt after the war. Its growth has been steady and rapid since the completion of the Erie Canal in 1825. Buffalo was the the first city in the United States to equip its street railway system with electric power. It has given two presidents to the United States, Millard Fillmore and Grover Cleveland. Population, about 510,000.

"BUFFALO BILL" (WILLIAM FREDERICK CODY, 1846–1917). What boy does not know of Buffalo Bill, one of the most noted of America's scouts, and the organizer of the world-famous "Wild West show"? And what boy has not longed to lead the life portrayed in the "Wild West," which was the kind of life led by Cody for years, while he was rendering his valuable services to the country as an Indian fighter? He was the last of the six great scouts of America of the series whose other members are Boone, Crockett, Carson, Bridger, and "Wild Bill."

"Buffalo Bill" was always a frontiersman, and he moved westward with the advancing frontier. Born in Iowa, his father took him to Kansas in early childhood. When the boy was only 11, the elder Cody died after being stabbed for expressing his hatred of slavery. While still in his teens young Cody became known for his daring and horsemanship as one of the riders of the "Pony Express," which carried the mail overland from St. Joseph, Mo., to Sacramento, Calif.—a distance of 1,950 miles—by means of relays of ponies, each rider covering 75 miles a day. In this way Cody gained the knowledge of the plains and of the Indians, which he used to such good advantage, after 1861, as scout for the United States army. Besides serving in the Civil War, he took part in campaigns against the Sioux and Cheyenne Indians, killing the Cheyenne chief Yellow Hand in single combat, and performing many other notable feats of skill and daring. His name of "Buffalo Bill" was gained in 1867, when he contracted to furnish fresh buffalo meat to the laborers laying the track of the Kansas-Pacific railroad. To do this, it is said, he killed over 4,800 buffaloes that year, his highest record being 69 in one day.

In the early 80's Cody began collecting some of the spectacular elements of the rapidly vanishing life of the plains. He gathered around him hundreds of cowboys, scouts, and Indians, and organized the celebrated "Wild West" show with which he toured America and Europe for 20 years. The profits of this enterprise were enormous, but "Buffalo Bill" knew nothing of the management of property, and he lost a large part of the money he had accumulated. He purchased large tracts of land in Nebraska and Wyoming, and founded the village of Cody, Wyo., at the eastern entrance to Yellowstone Park.

The brave old fighter's tomb is such as he would have chosen for himself. His body lies in a vault blasted out of the solid rock on the peak of Lookout Mountain, 20 miles from Denver, Colo.

BUILDING AND LOAN ASSOCIATION. When a person with a little money wishes to build a home in the United States he may secure the necessary capital through a type of coöperative bank known as a building and loan association. These private corporations have two purposes. They provide a good means of investment for the man with a limited financial experience, enabling him to keep his savings closely under his own eye; and they enable their members to secure money at reasonable rates for the purpose of buying homes.

The associations issue stock at $100 or $200 a share, which is paid for in weekly or monthly instalments by the members. The borrowers make their monthly payments the same as the others, and the essential difference between the two classes is that the borrowers are clearing their property from encumbrance while the others are accumulating money to invest in property. The borrowers are required to execute a mortgage to the association and to subscribe to the number of shares which will cover their loan. In addition to their regular payments, they also pay interest on the loan. When money is in great demand it is customary to lend it to those who offer the highest "bonus" or premium.

BUILDING *a* GIANT *with* BONES *of* STEEL

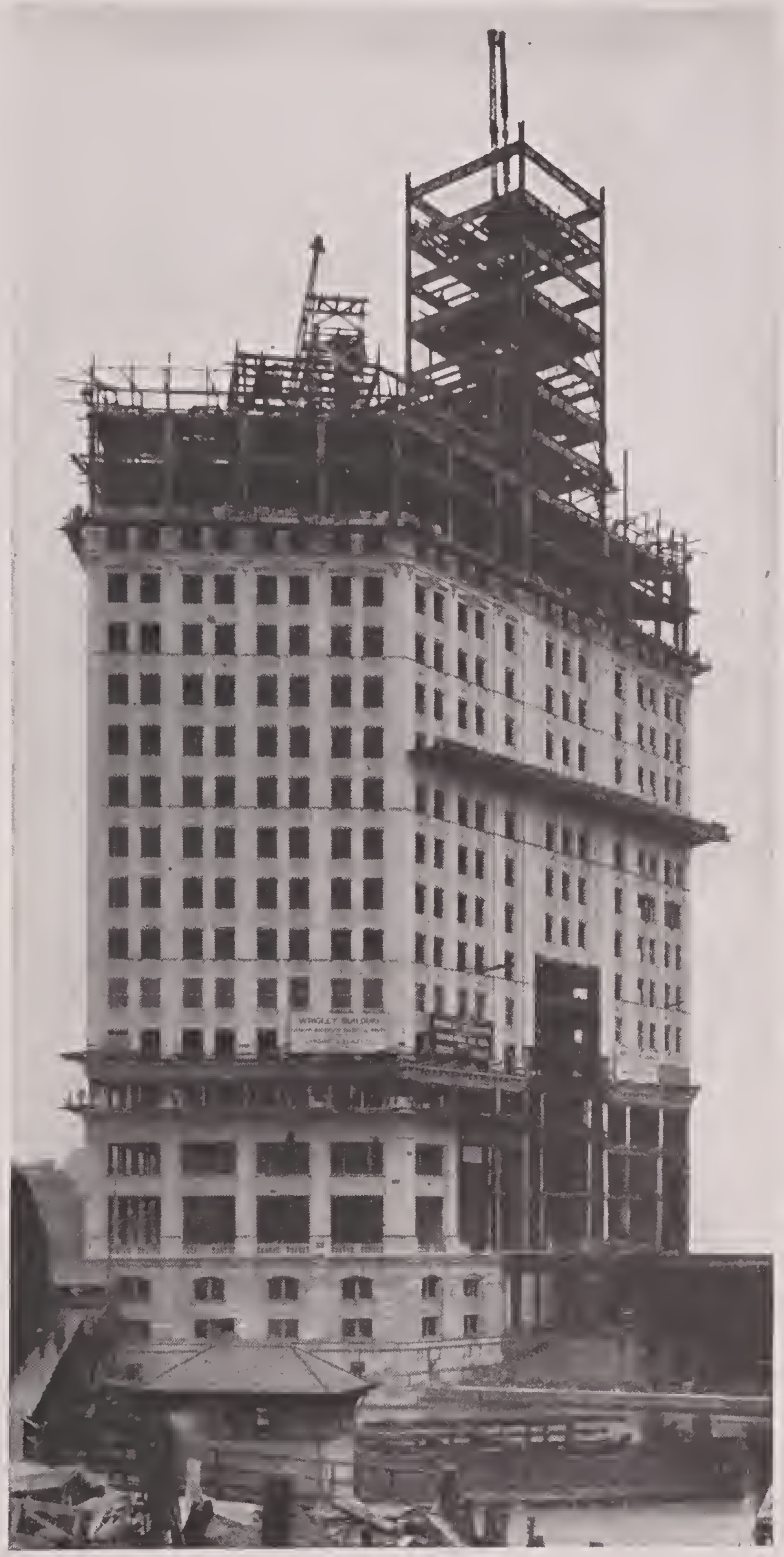
Story of the Skyscraper, an Incredible Achievement of Architectural Engineering that Dwarfs the Wonders of the Pyramids

BUILDING CONSTRUCTION. When the pyramids were built the great blocks of stone were quarried and carried long distances. The cutting was done with chisels and the blocks were polished by rubbing with pieces of quartz or quartz dust. The only mechanical helps in moving the great masses were probably the lever, the roller, and the inclined plane, and the only power was the labor of great numbers of oxen and tens of thousands of slaves, driven by the lash. No wonder that it took many many years to build each pyramid and temple, and to cut, transport, and erect the giant granite columns called obelisks.

The Skyscraper and the Pyramids

Contrast this with the construction of a modern office building in an American city. One week we pass a corner and an old building is being torn down to make room for a new "skyscraper." Six months later we pass that way and the completed structure, humming with the activity of its hundreds of busy tenants, towers into the air to a height that makes the buildings of former days seem almost like toys.

A SKYSCRAPER ON THE WAY UP



This skyscraper in process of construction will give you an excellent idea of the building principle employed in these imposing structures, that of erecting the steel skeleton first and then adding the walls. Note that the stone work of some of the upper stories has been filled in before that of the lower stories is complete. This is possible because the steelwork and not the stonework supports the whole structure.

An amazing achievement such as this is possible only because of the progress in science, manufacturing, and engineering which has revolutionized the building industry in the last half-century. Great quantities of structural steel are now made cheaply and rapidly in standardized forms; hoisting machines—cranes, derricks, etc.—have been invented to swing enormous weights from their powerful arms and drop them deftly in the proper place, so the building may be rapidly assembled; the manufacture of cement has been improved so that unlimited quantities of dependable material are made cheaply; engineering skill has developed foundations strong enough to carry safely the towering structures of stone and metal; and the country has been covered with a network of railroads by which the materials are brought quickly together. Another important factor in making our modern skyscrapers possible is the invention of the elevator, to carry passengers rapidly to the highest floors.

The need for buildings of such great height is also a recent development, due to the growth of the large cities of the United States in the latter half of the 19th century. With commercial and financial progress, the great seaports and railroad centers grew until they were densely crowded, and land for building attained a great value. There was an increasing demand for office and store space as an ever increasing number of people carried on their business in those limited areas.

With the old system of construction, it was not practicable to build high structures. The walls supported the entire weight of the structure, and to support a building of ten stories or more the walls must be so thick at the base that there was little room left for floor space, and the expense of construction was too great. The invention of steel-skeleton construction overcame this difficulty and made it possible to rear towering structures to a height never before dreamed of. The limits of such construction have not been reached, though the Woolworth building in New York City soars to a height of 795 feet.

In steel-skeleton building, a framework of steel is thrown up which carries the whole weight of the building, walls and all. The floor beams are riveted to the columns, just as a bridge is riveted together. The beams of each story jut out beyond the columns and bear the weight of the walls of that story. In this way the walls may be kept at a uniform thickness throughout, usually from 16 to 18 inches.

This is sometimes called "Chicago construction," because it was the idea of a Chicago man, and the first so-called skyscraper was built in Chicago.

Since the wall for each story is independent of the other wall sections, work can be started on any story where the framework is completed, or at several

THE USE OF "LIQUID STONE"
The system of distributing concrete in modern building construction is very simple, but it took plenty of brains and engineering skill to work it out. The framework tower you see at the left serves as a shaft for an elevator which comes up loaded with liquid concrete. Near the top of the elevator shaft is a hopper. Into this hopper the concrete is dumped and from there it passes through that long pipe which can be swung around to any part of the floor that is being "poured." The center picture shows the maze of scaffolding used between floors until the concrete hardens.

different levels at the same time. So as a great skyscraper is flung into the air, one often sees those aerial acrobats called structural iron-workers riveting together the framework at the dizzy height of 20 or 40 stories, while below them at various levels other groups of workmen are busy. Masons may be putting in walls at the fourth story, while the framework above and below is still uncovered. Perhaps another group of men is putting in concrete flooring at another level, while on some floors the work may be so far along that the carpenters and interior decorators and steam-fitters are already at work.

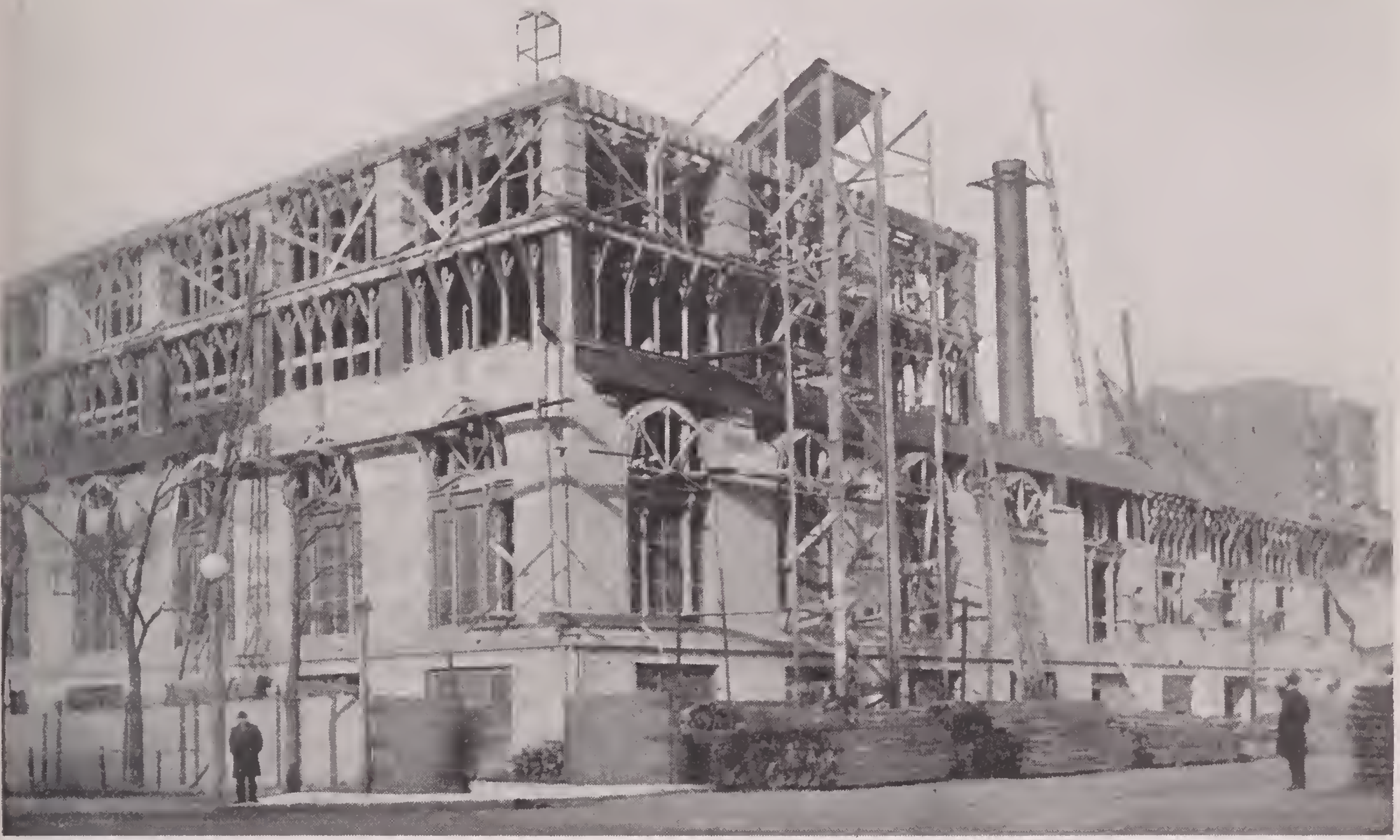
So staunch and rigid is the riveted framework of a modern steel building that architects tell us that if it were possible to upset one it would tip over like a box, instead of collapsing like a building of stone or brick. The framework must be strong enough to sustain the enormous weight of the whole completed structure, and be braced to withstand the wind pressure. The completed structure must also be elastic enough to resist possible side thrusts, such as might come from slight earthquakes or from vibrations caused by machinery within or the passage of trains nearby.

The most important parts of the framework are the columns, and these are accordingly made of very tough steel which will not break under sudden strains as ordinary steel does. Foundations often settle without impairing the strength of the building. Floor beams may bend or even break without causing great damage. But if the columns are too weak, the whole structure will collapse. These columns usually consist of long plates with one or more flanges attached at right angles by riveted angle-plates. They come as a rule in two- or three-story lengths, all ready to be riveted together as soon as they are hoisted into position by great derricks and cranes. All the steel is carefully painted several times to protect it from rust.

The firmest foundations are pillars of concrete that go clear down to bed-rock. The excavation is made under or in pneumatic caissons under great air pressure, and the caissons are filled with reinforced concrete which is allowed to harden. Many of the buildings of Chicago, where the soil is soft, rest on a forest of wooden piles driven deep down, or a "platform" foundation. For a

On the right is shown the network of steel rods which is used as the framework for a pillar of "reinforced" concrete. The mixture is poured into a mold surrounding this steel basket skeleton. This reinforcement is made in sections, one section for each story, and the sections are connected as the building goes up. Such "reinforced" pillars are perhaps the strongest of all building supports.

POURING A WHOLE BUILDING INTO MOLDS



The framework of this building is being constructed of reinforced concrete, and the picture shows the three different stages in the work. On the top story you see the wooden frame molds into which the concrete has been poured and left to set. On the second story are shown the concrete columns after the molds have been removed, but with the supporting braces still in place. In the first story the framework has all been removed and the walls of stone and terra cotta have been put in place. This method of construction is very rapid.

platform foundation, an excavation is made many feet below the surface covering the entire area of the building. In this is built a bed of iron rails or timbers and cement to support the columns. The general practice today, however, is always to sink caissons to bed-rock.

For the walls, cornices, and decorative features stone, brick, concrete, terra cotta, or tile are used, singly or in combination. Every effort is made to employ fire-proof materials to the greatest practicable extent. The floors usually are constructed of hollow tile arches placed between the floor beams, covered with concrete and surfaced with any desired flooring. For the inside partitions fire-proof hollow tile is often used; a netting of wire fastened to an iron framework at times takes the place of laths. The roofs usually consist of a number of thicknesses of heavy felt imbedded upon a smooth portland cement surface and covered with a roofing cement, on which are laid vitrified tiles, with joints thoroughly filled, practically forming a pavement. This is known as *actinolite.*

Architectural terra cotta has been developed to a very large extent in the past few years. This is a hard clay product nearly fire-proof and is very largely used in these big buildings for the interior of the walls as well as the superstructure. It can be glazed and made in almost any color and shape.

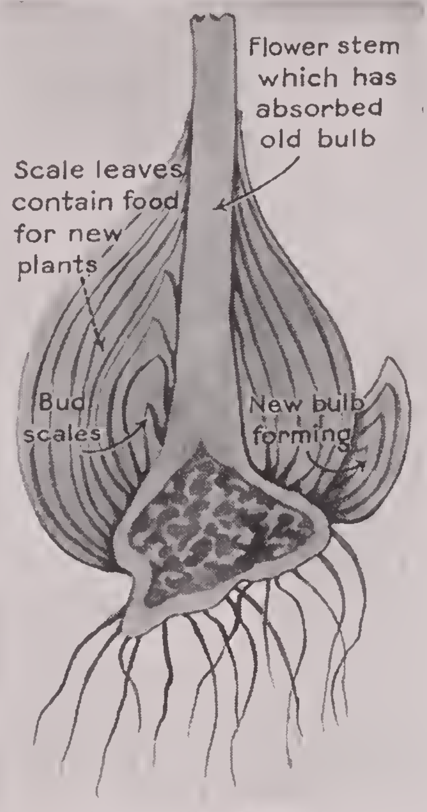
Special care is taken to enclose the steel parts in a non-combustible substance, for if one column of steel is twisted out of shape the whole building is in danger. Terra cotta is generally used for this purpose, because of its insulating qualities and light weight. Concrete is considered the ideal fire-resisting material, although nothing has been found that will successfully endure a long fierce fire. While the wood finishes used in most buildings for interior finishing catch fire easily, these fires can generally be confined to the room in which they start.

The recent development in the use of concrete is of no less importance than the invention of the steel-skeleton method. Up to certain heights reinforced concrete is almost as strong and durable as steel, and it has the added advantage of being far cheaper. By reinforced concrete is meant concrete in which steel rods are imbedded to give the strength, which ordinary concrete lacks, to resist a side pressure or a pull. Concrete resists great vertical pressure, but it yields to side pressure and pulls apart easily. In the construction of columns a sort of frame of iron rods is imbedded in the concrete to give it the necessary strength, and floors are made rigid by using two layers of rods, one crossing the other at right angles. Since the cement in the concrete shrinks and expands slightly with extreme changes in temperature, cracks soon appear in large buildings unless expansion joints are provided by putting in double columns and double beams separating the structure into units. Because of its cheapness, its adaptability, and the ease with which it can be worked, reinforced concrete is one of the most popular of modern building materials.

Concrete is made by mixing a cement, usually portland cement, with water, sand, and broken stone, pebbles, or gravel. From the mixing machine this is poured into forms of wood or steel, where it is allowed to harden. If no great side stress is to be resisted, no steel reinforcement is necessary, and the concrete is called *massive* concrete. In important structures the supporting frame is left on for two to four weeks, to give the concrete time to harden sufficiently. It is considered hard enough when a tenpenny nail will bend when one attempts to drive it into the concrete.

This material is also cast into hollow blocks, which are used like blocks of stone for building houses and other small structures. Concrete is also widely used in *stucco*, a mixture of concrete, gypsum, and sand. This is thrown up on a surface of lathing and makes a durable and cheap surfacing material. (*See also* articles on Brick and Tile; Cement; Concrete; Iron and Steel.)

THRIFT IN THE BULB FAMILY


Flower stem which has absorbed old bulb
Scale leaves contain food for new plants
Bud scales
New bulb forming

This picture illustrates how the members of the far-sighted bulb family prepare for the spring flower festival.

BULBS, TUBERS, AND ROOTSTOCKS. Among the earliest of the spring flowers which make our gardens and public parks beautiful are the gorgeous tulips, crocuses, and hyacinths, which boldly thrust their leaves above the ground and often burst into splendid blossom before the snows have entirely vanished before the mild breezes of spring.

What is the secret which enables these and other flowers to beat their rivals in the race to greet the spring? It is that they grow from bulbs, or bulblike stems, in which food has been stored through the long winters to give to the young plants a quick start over other plants which have to draw their food from the soil as they need it.

Let us see how this food is stored. Cut a tulip bulb in half, or an onion, which is also a bulb. You will see that it is made up of a number of thick fleshy layers, protected by dead tough papery leaves outside. In the center are thick little bud scales, from which the new plants grow. The broad surrounding scale-leaves, as they are called, contain the food for the young plants held in storage until they need it for their growth and development.

If you look closely at a crocus "bulb," you will see that it is different from the tulip or onion bulb. All the scale-leaves are thin and papery, and the food is stored in the stem itself, which is swollen to a white rounded lump. A bulblike stem of this sort is called a corm, and the familiar crocus, as well as many wild plants such as the Jack-in-the-pulpit, is thus provided.

Still other plants store food for the coming season's growth in tubers and rootstocks, which are much thickened underground stems of various forms. You will notice that in the potato, which is our most familiar tuber, the scale-leaves are tiny little things, with the buds in their axils. If you cut off a piece of a potato containing a bud—or eye, as we call it — and plant it in the ground or keep it in a warm place, it will sprout and begin to form a new potato plant. The iris, bloodroot, mandrake, various kinds of grasses, and many other plants grow from rootstocks, which look like large thick roots, but are really underground stems, because they have scale-leaves.

Plants which have such underground structures enabling them to pass through summer drought and winter cold, and to develop with great rapidity during the favorable season, are called "geophytes" or geophilous plants. Nearly all the typical spring flowers belong to this class, doing all their growing between the first coming of spring and the development of the heavy forest foliage which shuts them off from the sun's direct light.

A BULGARIAN "TAXICAB"

If you were in any village in Bulgaria and wanted a taxicab, this is the kind you would have to hire. It is not what one would call pretentious, but it is extremely safe. Horses too old to work in the fields pass a serene old age transporting passengers in these picturesque vehicles.

BULGARIA. A land of contrasts is Bulgaria. Sofia, the capital, is situated in about the same latitude as Chicago, and like that city it has a cold winter. But in summer Sofia is the center of a smiling land of sunshine and flowers. Crocuses, orchids, tulips, and lilacs grow wild on the mountain slopes of the southern third of the country, and in the valley to the north of the Balkan Mountains great fields of cultivated roses furnish the world's supply of the expensive perfume, attar of roses.

These fields of roses are the most gorgeous sight in Bulgaria. Before sunrise the women in their bright-colored gaily embroidered jackets and aprons, over their white lace-trimmed petticoats, are to be seen at work gathering the petals of the great Damask roses. Many of the men, too, are gaily adorned with bright jackets over their white trousers.

This little Balkan state is a nation of peasants. Fully three-fourths of the people are engaged in agriculture, and most of these own their own farms. True, the farms are not large, very few of them having more than 18 acres; but the farmer has in addition the right to pasture his cattle and to cut his wood on the common pasture and timber lands. The farming methods are primitive and the tools crude, but by hard work the farmer is able to raise more than he needs; so the nation as a whole exports wheat, tobacco, and some fruit.

The late ruler of Bulgaria, Czar Ferdinand, the "Balkan Fox," gained for himself an unenviable reputation as the "Judas of the Slavs" by the part which his country played in the Second Balkan War and the World War of 1914–18. In the latter conflict he allied his country with Germany and Austria, and with the old enemy of the Christian Slav states—the Turks—against Russia, by whose aid Bulgaria had won her independence. When the cause of the Central Powers collapsed in the autumn of 1918, Czar Ferdinand abdicated in favor of his son, Boris III. Naturally Bulgaria fared badly in the peace treaty. Its territory after the close of the war was about 40,000 square miles, and its population, about 4,500,000. (*See* map under Balkan Peninsula.)

BULL RUN, BATTLE OF. Thirty-five miles from Washington, on a little creek known as Bull Run, the Union and Confederate troops met on Sunday, July 21, 1861, in the first battle of the Civil War. The news of the resulting defeat of the Union troops, as it flashed over the wires the next day, caused the people of the North long to remember that day as "Dark Monday."

The North had expected the conquest of the South to be an easy matter. Troops were enlisted for only three months as it was thought that the war would be over in that time. A mob of volunteers had been gathered at Washington with little idea of what war meant. Officers had tried to make them into an army, but that takes time, and the press and people were impatient. The cry, "On to Richmond," the Confederate capital, had been raised on all sides, and the army command had yielded to the popular demand. On July 16 General McDowell had left Washington with his command, and five days later had met the Confederates near the little village of Manassas on Bull Run. When people in Washington heard that a battle was being fought, they hurried out to watch it as though on a holiday excursion.

At first the Union troops had seemed successful, but in the afternoon fresh forces joined the Confederates. The Union army was out-numbered and the men became frightened. Some started to retreat and other troops without orders began to leave the field. The retreat soon became a flight. They threw away their knapsacks, their guns, their coats, everything that could impede their progress. The one idea of soldiers and civilians alike seemed to be to get back to Washington and to safety.

The effect on the South of the "battle of Manassas" (as they called it) was to convince them that one of their soldiers was worth half-a-dozen of those of the North, and this conviction was shared by many persons in Europe. The defeat was a great humiliation to the North, but really it was a blessing in disguise. The North learned the bitter truth that the war was not to be a short one, and they began to prepare for it in earnest. Their people and government were determined to wipe out the disgrace suffered at the battle of Bull Run.

BUNKER HILL, BATTLE OF. When General Washington was told that there had been a battle at Bunker Hill he immediately asked: "Did the militia fight?" On being told that they had fought he remarked: "Then the liberties of the country are safe." By that one sentence Washington showed that he realized the importance of the battle of Bunker Hill, the first real battle of the American Revolution.

This famous battle was fought on June 17, 1775, before Washington took command of the army. The colonial forces had been holding the British shut up in Boston, but they learned that the enemy was planning to occupy some of the hills about the city. On the night of June 16, Colonel Prescott and his men started out to prevent this by occupying Bunker Hill, but they changed their plans and fortified Breed's Hill instead.

On the morning of June 17, the British were amazed to see trenches crowning the hill. The vessels in the harbor immediately began bombarding the fortification, and later in the day the British troops attacked it. Twice they advanced to the attack. All was silent as they marched up the hill, for General Putnam had given the command: "Don't fire until you can see the whites of their eyes." When they were within a few yards of the fortifications a sheet of flame swept down from the redoubt. The men in the front ranks were mowed down. The others beat a hasty retreat. A third time the British charged. This time the redoubt remained silent, for the powder of the colonial forces was exhausted. The patriots fought with clubbed muskets, but they were slowly forced to retreat to Bunker Hill, leaving the battlefield in the hands of the British.

It was a victory which had been dearly bought, however, for the British had lost 226 men killed and 828 wounded, while the loss of the Americans had been 145 killed and 304 wounded. The sentiment of the colonists toward the defeat was expressed by Nathanael Greene when he said: "I wish we could sell them another hill at the same price."

Today a granite shaft 221 feet high stands near the spot where the gallant General Warren fell just as the retreat began. The cornerstone of this "Bunker Hill Monument" was laid by Lafayette in 1825, the 50th anniversary of the battle, and the monument was dedicated in 1843, Daniel Webster delivering the oration.

BUNTING. Several small North American birds of the large finch family are sometimes called buntings, though the name is perhaps better reserved for a genus of European birds between finches and starlings, such as the corn bunting, reed bunting, and ortolan. The ortolans are highly esteemed as a table delicacy and great numbers of them are taken in nets. Among the American birds called buntings are the snow bunting or snowbird, the dickcissel or black-throated bunting, the vesper sparrow or bay-winged bunting, the indigo bird or indigo bunting, and the "lazuli," "painted," "varied," and "beautiful" buntings or finches. They all have plump stocky little bodies. (*See* Finch.)

BUNYAN, JOHN (1628–1688). To the Puritan children of former days, 'Pilgrim's Progress' had all the adventurous action and romance of a fairy tale, and was at the same time a sound religious allegory. Its author was born near Bedford, England, and like his father was brought up to the trade of tinker, or mender of small metal wares. Before his religious conversion he was very fond of dancing on the village green, playing at "tip-cat," and ringing the church bells—things he afterward thought sinful. He served in the Parliamentary army for some time during the English Civil War, while only 17 years old.

After the war he married a poor girl and became deeply interested in religion. Following a period of inner religious struggles, he joined the newly arising sect of Baptists and began to preach to the poor people in the villages around Bedford. Getting into discussions with the Quakers, another new sect of that time, in 1656 he published a book against them.

When the Restoration in 1660 brought back the established English church to power, Bunyan was imprisoned for his religious opinions. Altogether he was in prison 12 years, though he was continually told that he would be set free if he would give up preaching; to which he replied: "If you let me go today, I will preach again tomorrow." He supported himself and family while in prison by making lace, the remainder of his time being spent in reading the Bible, preaching to the other prisoners, and writing religious papers and books. He was finally released in 1672, preached for three years, was again put in prison, and was let out six months later.

It was while he was in prison the second time or even earlier that Bunyan wrote 'Pilgrim's Progress'. This work at once became famous and has since been translated into nearly a hundred languages. Its author could not guess that it was a masterpiece of English literature, for of English literature he knew nothing. The remainder of his life was spent as pastor of the Bedford Baptists, and as one of the recognized leaders of the independent religious sects for the whole of England.

BUNYAN DISCUSSING RELIGION WITH HIS NEIGHBORS

The "Inspired Tinker" used to sit before cottage doors mending pots and pans and talking religion with whoever would stop and listen.

THE STORY of PILGRIMS PROGRESS

ONCE John Bunyan "dreamed a dream." In this he saw a man named Christian who, although he was a good man, was much troubled in his mind because of certain things that he read in the Bible. It seemed to him that his sins were so heavy that they weighed upon him like a pack on his back. His loving wife and children could not see this burden and thought he must be losing his mind. He was much distressed, for he thought that the City of Destruction, in which he lived, was so wicked that it would be burned by fire from Heaven. As he was walking and crying in the fields, he met Evangelist, a good man who said to him, pointing with his finger over a very wide field: "Do you see yonder shining light? Keep that light in your eye and go directly thereto. So shalt thou see a wicket gate; at which when thou knockest it shall be told thee what thou shalt do."

Christian was so eager to be off on his pilgrimage that he began to run. His wife and children called and begged him to come back. Two of his neighbors, Obstinate and Pliable, overtook him and tried to fetch him home again. When he refused to return Obstinate left him, but Pliable went on with him a little way. Soon they came to the Slough of Despond, a wide miry bog. When they began to sink into the dreadful mud, Pliable grew afraid and turned back. Christian struggled through to the other side, but could not get out because of the pack on his back. Then Help came up and set him on solid ground.

CHRISTIAN AT THE CROSS

"At the top he came to a Cross. There his burden fell from his shoulders and rolled down the hillside."

Very soon Christian met Mr. Worldly Wiseman, who warned him of the "wearisomeness, painfulness, hunger, perils, unkindness, sword, lions, dragons, darkness, and, in a word, death," which awaited him along that path; and offered him an easier relief from his pack, by the aid of Mr. Legality who dwelt in the village named Morality. But as Christian tried that way, the road became so steep and hard that he grew afraid. Then Evangelist appeared to him once more and after rebuking him set him again in the path which led to the wicket gate.

When Christian arrived at the gate, he found written over it these words, "Knock and it shall be opened unto you." Goodwill opened the gate to him and pointed out the road along which he must continue his journey.

"Dost thou see this narrow way?" he asked. "That is the way thou must go. It was cast up by the patriarchs, prophets, Christ and his apostles, and it is as straight as a rule can make it."

After tarrying for a time in the Interpreter's House, where many things were made plain to him, our Pilgrim set out once more on his journey. He toiled up a highway that was fenced with the Wall of Salvation, and at the top he came to a Cross. There his burden fell from his shoulders and rolled and tumbled down the hillside to the mouth of the Sepulcher, or tomb, where it fell in. He never saw his load again.

Then was Christian glad and lightsome, and he cried for joy. And suddenly three Shining Ones stood before him and said: "Peace be to thee. Thy sins are forgiven thee." They clothed him in clean garments, set a mark on his forehead and gave him a parchment roll, and bade him not to part with it until he came to the gate of Heaven. So Christian went on, singing.

The Pilgrim thought his troubles were now at an end. But soon he had to climb the steep Hill of Difficulty, and midway of the hill he stopped to rest and fell asleep and lost his roll. When he discovered his loss he had to go back for the roll and climb that dreadful hill once more. Timorous and Mistrust, who had lost heart and were returning, warned him of roaring lions before the gate of the Palace Beautiful, but Christian went on. When he came to the lions they were chained, and Watchful, the porter, called to him to keep in the middle of the path and have no fear. So he made his way in safety into the Palace Beautiful; and there he was welcomed by four grave and beautiful damsels, Discretion, Piety, Prudence, and Charity.

THE LIONS AT THE GATE

"Timorous and Mistrust warned him of roaring lions before the gate, but Christian went on. When he came to the lions they were chained, and Watchful, the porter, called him to keep in the middle of the path and have no fear."

Christian tarried for several days in the Palace Beautiful. He was there furnished with armor provided for pilgrims—a sword, shield, helmet, and breastplate, all of prayer, and shoes that should not wear out. And from the top of the house they showed him the Delectable Mountains, in the midst of a most pleasant country, beautiful with woods, vineyards, fruit, and flowers of all sorts, with springs and fountains. This he was told was Immanuel's Land, and from the top of the mountains he should see the gate of the Celestial City.

Down a steep and slippery hill slope the Pilgrim journeyed into the Valley of Humiliation. There he met the foul fiend Apollyon, with scales like a fish and wings like a dragon, breathing fire and smoke. When Apollyon could not prevail upon Christian by flattery or persuasion to turn back, he straddled across the narrow path and gave battle to him, hurling fiery darts at Christian's breast.

The Dreadful Struggle with Apollyon

For half a day they fought. Christian was sore wounded in hand and foot and head. Apollyon struck his sword from his hand and pressed him almost to death. But Christian got his sword again, and struck Apollyon such a blow that he spread his dragon's wings and flew away. While Christian lay spent from battle and loss of blood, there came to him one who brought leaves from the Tree of Life to heal his wounds, and he went on his way rejoicing.

At the end of this valley was another, called the Valley of the Shadow of Death. He could scarcely see for the gloom of night. A deep ditch bordered the path on one side, and a wide bog on the other. And in the middle of the valley was a fiery cavern wherein dwelt hobgoblins, satyrs, and dragons of the pit. But Christian drew his sword and went steadfastly on. At last he came safely through, and he thought he heard a voice going before him saying:

CHRISTIAN ROUTS APOLLYON

"For half a day they fought. Apollyon struck his sword from his hand and pressed him almost to death, but Christian got his sword again and struck Apollyon such a blow that he spread his dragon's wings and flew away."

EVANGELIST STARTS CHRISTIAN ON HIS JOURNEY

Evangelist is here pointing out to Christian the wicket gate through which he must pass in order to escape the wrath to come, of which he has been warned on the parchment roll which he holds in his hand and which was given to him by Evangelist. When Christian arrived at the gate he found written over it "Knock and it shall be opened unto you." Then Goodwill opened the gate and pointed out the road along which he must continue his journey.

"Though I walk through the Valley of the Shadow of Death, I will fear no evil; for thou art with me."

Two Friends that Meet in the Dawn

In the dawn he overtook Faithful who was on the same journey. Very glad of good company they went on together, and as they emerged from a great Wilderness, Christian saw Evangelist again, behind them. He gave them much good counsel, but predicted that one of them should die a martyr's death.

Christian in the Clutches of Giant Despair

Then, presently, they came to a city in which was being held a fair called Vanity Fair, wherein were sold all sorts of vanities. And because they would not stop for the many pleasures of this world, they were beaten, and covered with mud, and cast into prison. Faithful was cruelly put to death, and was immediately carried in a chariot to the Celestial City. But Christian escaped, and as he left the town he met with Hopeful, who continued with him on his way. They had a terrible time on rough roads. They lost their way and were nearly drowned in rushing waters. Giant Despair drove them into the gloomy dungeon under his Doubting Castle, and beat and starved them. But Christian opened the huge door with the Key of Promise. Giant Despair heard them making their escape, but as he tried to pursue them he fell in a fit, to which he was subject, and so failed to overtake them.

At last the two Pilgrims stood among Shepherds on the top of the Delectable Mountains. Afar off they saw the gate of the Celestial City shining in the sun. The Shepherds then advised them concerning the rest of their journey and sent them on their way. Flatterer led them into a net, but an angel set them free. Then they came to the Enchanted Land, and to the Land of Beulah, whose air was very sweet and pleasant. The fields and woods were full of flowers and singing birds and bright streams.

Nearer and nearer they drew to the gate of the Celestial City that was built of gleaming pearl and sparkling jewels, with streets paved with gold. But before it rolled the wide, deep, raging River of Death. There was no bridge; only faith could bear them across the flood.

In fear and trembling they entered the cold rushing water. Christian began to sink, but Hopeful held him up. Then they took courage and their feet touched bottom. The billows fell back and they crossed in safety. The Shining Ones came out to meet them. They helped the Pilgrims up a mighty hill.

When their rolls were at last given to the angel at the gate, their garments became like gold. With harps and crowns they entered the Celestial City. The bells pealed out in joy, and all the angels sang. When Great Heart brought Christian's wife and children out of the City of Destruction to join him, he was the happiest of all the hosts in Heaven.

—*Retold from Bunyan's 'Pilgrim's Progress'.*

Burbank, Luther (1849–). In fairy stories we read of magic wands with which rags are turned into satin garments and rocks into precious stones. The modern magic wand is science; and one of the most famous of scientific conjurers is Luther Burbank, who turns weeds into beautiful flowers and poisonous plants into sweet fruits. He can take two different plants and produce from them a new vegetable or fruit unlike anything that has ever been known before. He has developed a plum without pits, another with the flavor of the Bartlett pear, a white blackberry, a plumcot (made by crossing the plum and the apricot), and the wonderberry (a cross between the raspberry and dewberry). He has made crimson poppies out of yellow ones, improved the rose and the lily, and produced the beautiful Shasta daisy. Most wonderful of all, he has taken the thorny desert cactus, and bred it until it has become a thornless producer of nutritive food for man and beast—capable, he believes, of turning arid deserts into rich pastures and affording food for twice the number of people now on the earth.

Probably the best known of the plant wizard's work is the Burbank potato, which, it is estimated, has already added $20,000,000 to the wealth of the United States. Noticing that the potatoes in Massachusetts, his early home, were small and irregular in shape, he set about improving them. Among the plants which he was raising, one alone bore a seed ball. By planting these seeds and then using the seeds of only the best plants which they produced, he evolved in a few years a larger and more regularly shaped potato. This is called breeding by selection, and is practiced to some extent by every good farmer. The usual method now used by Burbank, however, is to cross different plants or different species of the same plant to secure variations. This process is known as hybridization, and the results are hybrids.

THE PLANT WIZARD AND SOME OF HIS ACHIEVEMENTS

This is one of the many members of the cactus family which Burbank has "taught" to grow without thorns.

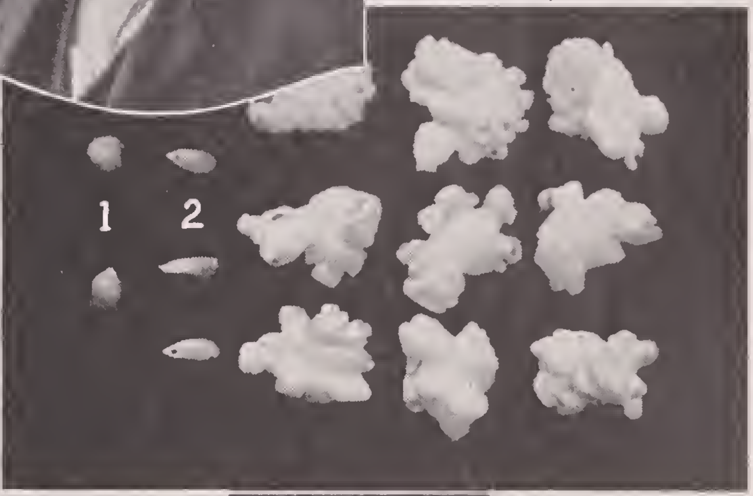
Here we see the fruit of the "Thornless" prickly pear. This one of Burbank's "plant children" is eaten by human beings. The pulpy leaf of the prickly pear, robbed of its prickles, is a favorite and nourishing food for cattle in the southwestern states.

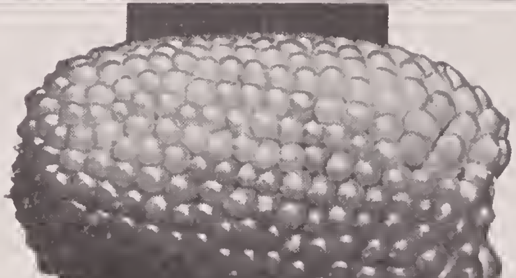
Having produced numberless forms, he runs his eye over the product and with amazing quickness and sureness of judgment picks out a few—sometimes only one among thousands—which are to be allowed to live and reproduce. The others are thrown away. (*See* Plant Life.)

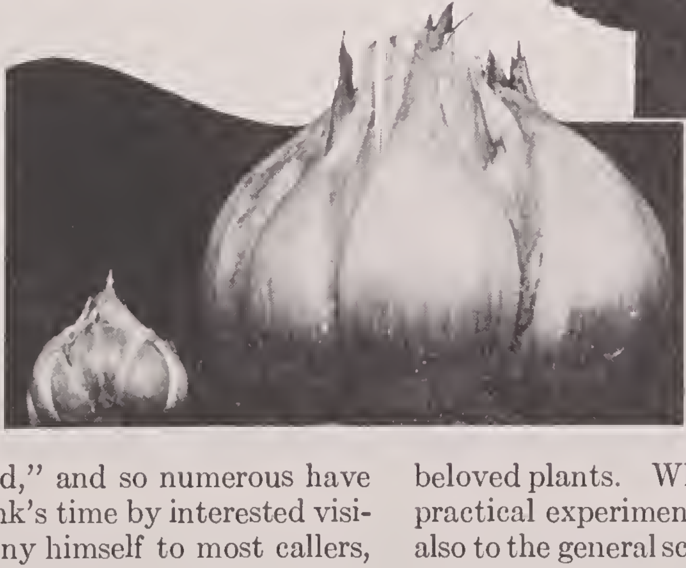
Burbank was born in Lancaster, Mass., of English-Scotch stock, received a grammar and academy education, and went to work in a plow factory. He showed that he had inventive powers even then, but he left that work for the kind of activity which he was to follow the rest of his life—market-gardening and seed-raising. His poor health demanded a milder climate; and using the $150 which he had received for his rights in the Burbank potato, he went to Santa Rosa, Calif. There, after doing handy work about the farms in the neighborhood, he established a nursery, which he sold in spite of its being very profitable, in order that he might continue his experiments with plants.

Burbank is not primarily a scientist; he is chiefly an experimenter in plant breeding. His practical results in new flowers, fruits, and vegetables had, unknown to him when he began, found their scientific explanation in 1869 in the work of Mendel, an Austrian monk. Burbank's great success is due to his persistence and devotion, and above all, to his marvelously keen eye for discovering the one exceptional plant or "sport" amid thousands in a whole field.

The fame of his achievements has reached the far corners of the world. Foreign experts are sent by their governments to study the methods of the "wizard," and so numerous have been the calls upon Burbank's time by interested visitors that he has had to deny himself to most callers, living almost like a cloistered monk in the midst of his beloved plants. While his work has been confined to practical experimenting, his results have contributed also to the general scientific theories regarding heredity and other branches of biology.







Burbank's "sorghum pop," produced by crossing sweet corn with Kaffir corn. It is pure white, and sweet. It has a "pop" like a firecracker, and there is no hard portion of the kernel left after popping. Fig. 1 shows a grain of the common popcorn, Fig. 2 the "sorghum pop." Below is the corn on the cob. Next we have the common garlic and Burbank's "elephant garlic," a single "clove" of which is as large as a whole cluster of ordinary garlic.

BURKE, EDMUND (1729–1797). In the stormy days before the American Revolution, during a bitter debate in the English Parliament over the question of taxing the American colonies, one of the members of the House of Commons hotly asked: "Should not America belong to this country?" A calm clear voice replied: "If we have equity, wisdom, and justice, it will belong to this country; if we have not, it will not belong to this country."

The voice was that of Edmund Burke, and his words were prophetic; for if England had adopted the wise and moderate policies which he advocated, the history of America would probably have been very different. Again and again this Irishman—awkward in his tight brown coat and little bob-wig, yet a commanding figure nevertheless—rose in Parliament and fought, now with all the warmth of his passionate sense of right, now with the cold penetrating strength of his logic, for the principles of justice and liberty as he believed they applied to the great questions of the day.

Burke was usually on the losing side, but his influence was felt as a powerful force in his own time. His speeches—especially his magnificent addresses 'On Conciliation with the Colonies' and 'On American Taxation'—are read and studied today as masterpieces of oratory; and he is regarded as one of the greatest thinkers of his time on questions of state.

Born in Dublin, Ireland, and educated there at Trinity College, Burke came to London to study law. His 'Inquiry into the Origin of Our Ideas on the Sublime and Beautiful' brought him recognition as a philosophical writer, and he became a member of the famous literary club of which Dr. Johnson was leader. Johnson once remarked that "no man of sense could meet Mr. Burke by accident under a gateway to avoid a shower, without being convinced that he was the first man in England." Burke was soon able to support himself by his literary work, especially his yearly review and commentary on American affairs in the *Annual Register*.

Burke's Political Career

In 1765 he became private secretary to Lord Rockingham, the Whig Prime Minister of the day, and the next year was elected from a "pocket borough" to Parliament. Though Burke never held high office, he at once became prominent because of his wide knowledge, his penetrating judgment, and his brilliant oratory.

After his unsuccessful struggle in behalf of the American colonists, Burke came forward as the champion of another subject people, this time the natives of India. He moved the impeachment of Warren Hastings, the governor of India, whom he charged with plundering the hapless natives. Although Hastings was acquitted, and many now believe that Burke was mistaken in his judgment, his powerful speeches drove home the lesson that the rights of a subject people must be respected.

When Burke later came out in opposition to the French Revolution, many of his former political friends regarded him as a "turncoat," for now he seemed to have abandoned the cause of liberty. But Burke had before argued only for the rights of the individual as against an unjust government. He was essentially a conservative and never a believer in "government of the people, for the people, by the people"; thus he persistently opposed the reform of Parliament. Liberty, he held, is "inseparable from order"; and the lawlessness and bloodshed of struggling democracy in France so aroused his indignation and filled his mind that he could see no good in it. His views were expressed in a pamphlet entitled 'Reflections on the Revolution in France', to which James Mackintosh's 'Vindiciae Gallicae' and Thomas Paine's 'Rights of Man' were replies.

The Blow that Crushed Burke's Soul

Until he published his attack on the French Revolution Burke is described as "a man decried, persecuted, and proscribed; not being much valued even by his own party." His attitude on the great movement across the channel completed the breach with Fox and the Whigs; but to compensate he was made much of by the Court and the Tories. King George III wished to honor the champion of the old order by making him a peer; but before the title was conferred Burke suffered a blow which took from him all ambition for honor. He lost his only son, whom he loved passionately. "The storm has gone over me," he wrote, "and I lie like one of those old oaks which the late hurricane has scattered about me. I am stripped of all my honors; I am torn up by the roots and lie prostrate on the earth." A pension was all the broken-hearted man would accept. He retired from Parliament and died three years later.

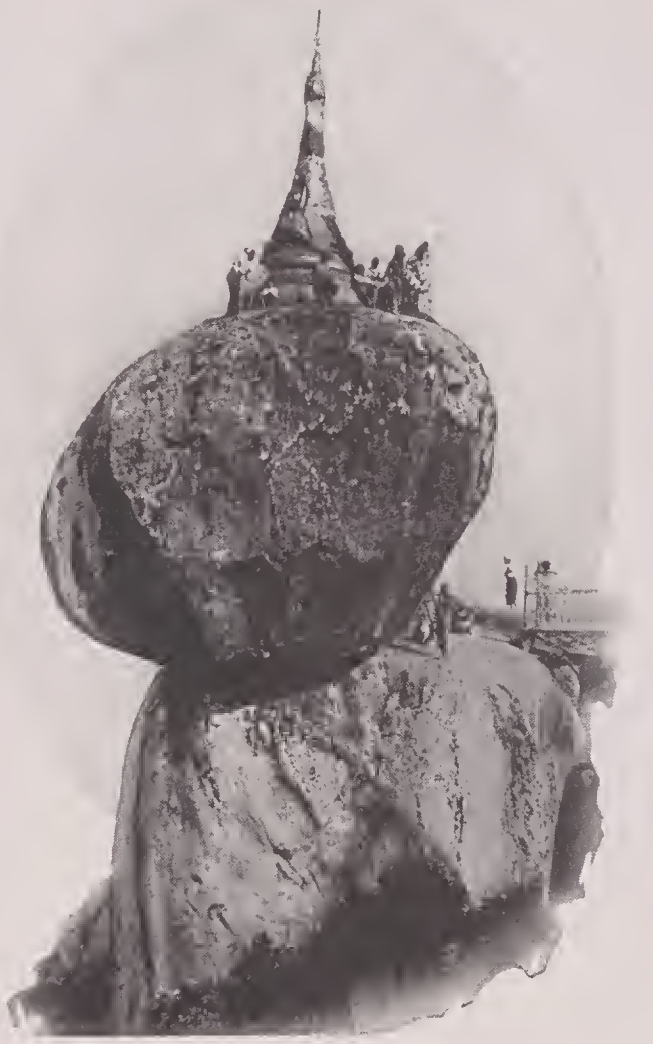
BURMA (*bûr'ma*). A noisy good-natured struggle for right-of-way begins the moment the big bazaar-boat's gangplank settles into the oozy mud of the Irrawaddy River, the "Grand Trunk Road" of Burma. Some want to get on, some to get off, this floating department store that ties up at every village of any size the whole 900 miles of the Irrawaddy's navigable length. It stays until the last customer leaves, his arms piled high with bundles of every shape and size—rice, his principal food; fish, dried and salt; yellow and pink striped silks; "whackin' white cheroots" for the whole family, even the children; and perhaps baskets, beaten silver boxes, and white sapphires from the bazaar at Mandalay.

All these fascinating wares are displayed in little booths on the boat, each in charge of its owner and total salesforce—a Burmese woman. She is short, stocky, practical—the real backbone of Burmese business—and often very pretty. Her blouse is the upper part of a plain white shift, and her skirt is merely a length of bright silk wound round and round and tucked in at the waist-line. This costume sets off to advantage her round dark-olive face (usually powdered with yellow fuller's earth), her big brown eyes, and her coal-black hair, into which she has pinned a flower or two. Her husband is dressed in gorgeous silk robes, but he doesn't count in the establishment, for he doesn't work.

Her customers, coarser in dress and more Mongolian in appearance than she, are the Shans, the Chins, and the Kackins who live in the hills back from the river, or in the thick jungle where grow rare orchids of a thousand varieties, tall feathery bamboos, teak trees (one of Burma's chief sources of wealth), rubber trees, and the cutch or catechu plant which supplies rich brown coloring for silks.

On the river bank the villagers have spread the wares they have to sell on scattered straw—three-tiered lacquer boxes in several colors, made on a horsehair foundation and as pliable as morocco; lacquered bowls and baskets; perhaps rubies, tourmalines, or royal blue sapphires, for the world's finest rubies and sapphires come from the region which centers about Mogok, 90 miles northwest of Mandalay. They may also have jade from the jade mines of the north of Burma, which are now practically the only source of supply of that beautiful lustrous greenish stone so much liked by the Chinese. The village straggles along the edge of the jungle. Its few streets are paths, and the foot-passenger needs to be armed with a stout stick to ward off the mangy snarling *pariah* dogs that infest the land. The one- or two-roomed wooden houses are built on piles, as a protection against dampness and fever, as well as against snakes and night-prowling beasts of the forest.

A CHURCH THAT ROCKS WITH THE WIND



Thoughts of the next world should not be difficult to worshipers at the Kyaktiyo Pagoda, in the mountains of Burma. For not only does this boulder overhang a steep chasm, but it rocks gently back and forth when the wind blows.

When You Get to Mandalay and Rangoon

When the bazaar-boat reaches Mandalay, the capital of Upper Burma, its traveling shopkeepers find themselves in very different surroundings. Mandalay stretches along the Irrawaddy like a military camp, six miles long and two broad (population, about 140,000). Its gay bazaars are thronged by a curiously mixed population of Mohammedans, Jews, Hindus, Chinese, and tribesmen from the hills, with many British soldiers from the nearby cantonment. One of the sights of the city is the old palace of the kings, made of wood delicately and elaborately carved, its gold-leaf covering in places softened into dusty pinks. Monasteries, pagodas, and other examples of the graceful architecture of the royal period, go to make up the peculiar charm of this ancient little city on the Irrawaddy River.

The chief city of Lower Burma is the busy port of Rangoon (population, about 295,000). Her river is crowded with shipping, her docks piled high with merchandise, her streets filled with the sailors and globe-trotters of the whole world. At Rangoon also is stationed the British lieutenant-governor who administers Burma as a part of Britain's Indian Empire.

Burma, with an area of about 231,000 square miles, a little less than that of Texas, is the largest province of British India. It consists of a wide tract along the east side of the Bay of Bengal, ridged by many mountain ranges with rivers flowing in the valleys between. High mountains, reaching 15,000 feet in the north, shut it off from Tibet, China, and Siam. Upper Burma, for the most part heavily forested, is subject to much greater extremes of heat and cold than the Irrawaddy delta country, a vast plain of 12,000 square miles, where enormous crops of rice are grown—Burma's largest crop. Two-thirds of her people are engaged in agriculture and kindred occupations. From great oil fields comes nearly all the petroleum used in India.

Nine-tenths of the Burmese are Buddhists. The priests give free instructions to children, so that, for an oriental country, Burma has a high percentage of literacy. The Burmese for the most part are easy going and cheerful, very different from the caste-ridden peoples of India proper. The women enjoy a high degree of freedom.

Burma was conquered and taken under British rule in 1886, after nearly a century of frontier and trade dispute with the native sovereigns. The country has been a notable field of American missionary endeavor ever since the time of the Rev. Adoniram Judson, who began his labors at Rangoon in 1813. Many converts, the compilation of a Burmese grammar and dictionary, and a Burmese translation of the Bible were among the fruits of his 37 years' service. Population, nearly 13,000,000.

BURNS, ROBERT (1759–1796). In the years when the American colonies were drifting inevitably to separation from the mother country, a peasant lad of Scotland might have been seen daily following the plow on his father's little farm, or reaping the grain in harvest time, or doing a man's full share in the other duties of the farm. One thing, however, distinguished him from the many other Scotch lads whose youthful days were spent in the same hard toil. He always had in his pocket a volume of verses or an old play or some other volume from his father's slender library; and when the horses would rest at the end of a furrow, he would snatch a few hasty glances at the words he loved so well, to turn them over and over in his mind while he plodded down the next furrow. And at night he loved to try his hand at writing verses picturing his admiration for some pleasant-faced lassie, or describing the sights and sounds of his life in the fields. All living things were dear to him, and when his plow relentlessly uprooted a mountain daisy he would pause to mourn in such matchless lines as these:

> Wee, modest, crimson-tipped flower,
> Thou'st met me in an evil hour;
> For I maun crush amang the stour
> Thy slender stem.

And if some terrified little field mouse were driven by a similar mishap from his warm underground home, the boy would grieve for the "wee, sleekit, cowrin', tim'rous beestie."

Such was the boyhood of "Bobby" Burns, Scotland's greatest poet, whose songs of humble life have sung themselves into the hearts of the world. He was born near the village of Ayr in such a home as he pictures for us in "The Cotter's Saturday Night." His father was a fine type of Scotch peasant, honest, intelligent, and god-fearing; but his unceasing toil from morning till night could barely wrest a livelihood from the stubborn soil, and Bobby, the eldest of seven children, was forced at 13 to begin his labor on the farm and at 15 to do a man's work.

ROBERT BURNS
The Ploughboy Poet

But hard though their life was, Bobby and his brothers and sisters enjoyed many precious hours when the day's toil was done, listening while their mother sang to them songs of early days, or hearing their father read aloud the stirring tales of the Bible. The whole family loved to read, and visitors dropping in at mealtime would sometimes find them all seated around the table, a spoon in one hand and a book in the other. But "the unceasing toil of a galley-slave" overtasked the youthful poet's strength and threw him into fits of melancholy from which in later youth he sought refuge in the gay tavern life of the village, forgetting his sorrows in scenes of what he called "swaggering riot and roaring dissipation."

The "Ploughboy Poet" Leaps into Fame

By the time he was 26 his father had died, and Burns, discouraged by the hard struggle against poverty as well as by a disastrous love affair, decided to leave for the island of Jamaica to begin life anew. To get money for this venture, he published a volume of the verses he had been writing since boyhood. They met with instant success, and the fame of the "Ayrshire ploughman" grew so great that Burns gave up his plan to emigrate. He received about $100 for his share of the profits on his book of verse, a single copy of which is now worth thousands of dollars. With this money he went to Edinburgh, where he was flattered and feasted, petted and lionized by the learned and wealthy. After a season the novelty of the ploughboy poet wore off, and the fickle crowd forgot him. Burns, who had received all their attentions with simple dignity, went back to Ayrshire, unaffected as before, not without some feeling of bitterness toward those of high station, but with a stronger love than ever for the common man.

In 1788 he married "Bonnie Jean" Armour, whom he had long loved, and soon after he received an appointment as inspector of the liquor customs, which, together with his farming, promised to secure him a livelihood. But the new office proved his undoing, for he was thrown more than ever into riotous company. Weakened by drink and dissipation, he contracted a fever, and died at the age of 37.

Burns' Place among the Poets

In spite of his frailties, Burns is one of the best of lyric poets. The soil, the air, the very spirit of his native country is in his verses, so that "you can fair smell the heather." His best poems are in the Scottish dialect. But his humanity embraces the whole world. No one before him had sung with such genuine feeling the worth of the common man, as he does in 'A Man 's a Man for a' That':

> The rank is but the guinea stamp,
> The man 's the gowd (gold) for a' that.

His sparkling, often rollicking, humor, his joyousness, his deep seriousness, and tender pathos are some of the many sides of the great heart revealed in his poems. He is the greatest song-writer in the English language. His patriotism and love of freedom breaks out in ringing war-songs, as 'Scots Wha Hae wi' Wallace Bled', while in the music of such love-songs as 'I Love My Jean', 'A Red, Red Rose', 'The Banks o' Doon', 'Highland Mary', and 'To Mary in Heaven', we catch the very heart-beat of the poet.

Among the most familiar of Burns' many poems are: 'The Cotter's Saturday Night'; 'To a Mouse'; 'To a Mountain Daisy'; 'Address to the Deil'; 'Address to the Unco' Guid'; 'A Bard's Epitaph'; 'I Love My Jean'; 'Auld Lang Syne'; 'John Anderson, My Jo'; 'The Banks o' Doon'; 'Highland Mary'; 'My Heart's in the Highlands'; 'Scots Wha Hae wi' Wallace Bled'; 'A Man 's a Man for a' That'; 'Tam o' Shanter'.

BURR, AARON (1756–1836). Third vice-president of the United States, Aaron Burr was a man of brilliant gifts, who was betrayed by vanity and ambition into questionable if not treasonable enterprises. Born in Newark, N. J., he was graduated from Princeton College in time to win distinction in the Revolutionary

War. For some reason never made public, Washington reversed his first favorable opinion of him.

As a lawyer in New York City, Burr's fine mind, polished manners, and magnetic personality brought him rapid rise in social and public life. He was elected to the United States Senate in 1791, and to the vice-presidency (with Jefferson) in 1800. But the party of Jefferson soon abandoned him, and in 1804 he became the candidate of the Federalists for the governorship of New York. Alexander Hamilton, however, and other leading Federalists opposed him because they believed his political conduct was unscrupulous, and he was defeated. Angered by this, Burr challenged Hamilton to a duel, and killed him. Although acquitted on the charge of murder, he had destroyed himself socially and politically.

Burr then engaged in an obscure conspiracy for the supposed purpose of forming a new republic on the lower Mississippi, with himself as a Napoleonic conqueror of a part of Mexico, and with a gay French capital in New Orleans. An armed expedition was actually launched on the Ohio, when Burr was arrested in 1807. Treason was not proved, but popular opinion as before condemned him. Then his idolized daughter, Theodosia, wife of Governor Alston of South Carolina, whom Burr himself had educated into one of the most charming and intellectual women of the day, was lost (in 1812) in some mysterious tragedy of shipwreck or piracy at sea. Burr returned to New York, but was unable to recover his law practice. Ruined, and forsaken by his friends whom he had used and betrayed, he died at the age of 80 in poverty and neglect.

BURROUGHS, JOHN (1837-1921). Once John Burroughs, the famous essayist who wrote so much about nature, was asked to write to a class of children who were studying rhetoric. This, among other things, was what he wrote: "I think I have got more help as an author from going a-fishing than from any text-book or classbook I have ever looked into. Your teacher will not thank me for encouraging you to play truant, but if you take Bacon's or Emerson's or Arnold's or Cowley's essays with you, and dip into them now and then while you are waiting for the fish to bite, she will detect some fresh gleam in your composition when next you hand one in."

Not many boys, however, make fishing what John Burroughs made it, an opportunity to study nature and the best essayists at the same time. The letter is not so much advice as it is a revelation of the man Burroughs, who more successfully than any other writer of our age has joined nature study with literature and the lives of men. Thoreau could live a recluse at Walden Pond, but Burroughs could do this and turn from it to the human pleasure of tramping and arguing with Theodore Roosevelt. It is no wonder that children all over the country loved Mr. Burroughs. Not only children, but grown-ups too, have made pilgrimages in thousands to his simple cottage "Slabsides" near the Hudson River, and his other homes.

Born on a farm in New York State, he grew up among the sights and smells of the country. When a little older he taught in a country school for about eight years. Then he worked at a clerkship in the treasury department in Washington for ten years more, and was afterwards a national bank examiner. But business did not satisfy him, and when he was 46 he built a house on the banks of the Hudson River, where he lived the peaceful contemplative life he loved, cultivating fruit and writing.

JOHN BURROUGHS

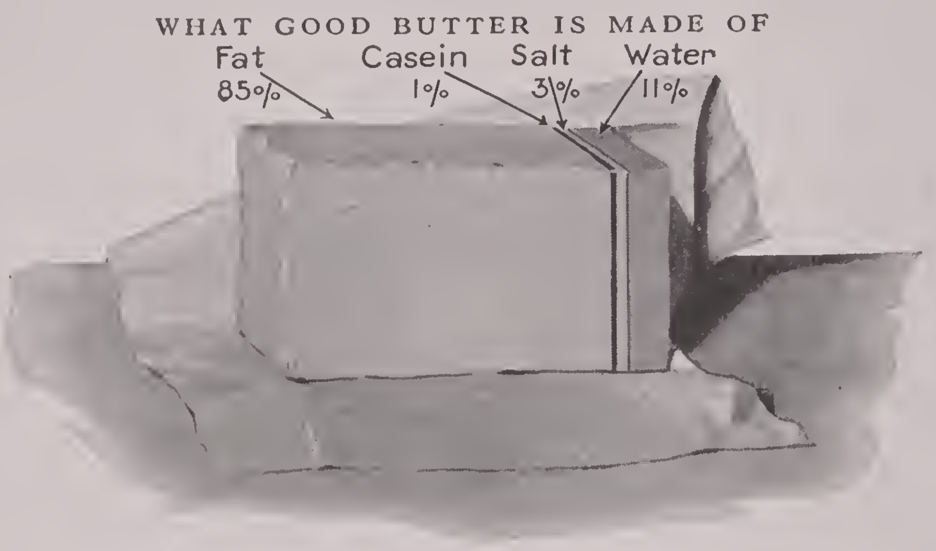
The philosopher-student of Nature, who has read "sermons in stones and books in the running brooks." His essays are distinguished by original thought and literary charm.

Burroughs was a writer by instinct and at 14 had already begun to write essays. At 24 he succeeded in having an essay published in the *Atlantic Monthly*, and from then on he became a frequent contributor to magazines and newspapers, and also wrote a large number of books. Most of these are on nature study, though a few are on literary subjects. He also wrote some delightful records of travel.

Burroughs' best-known works are: 'Wake Robin' (1871); 'Winter Sunshine' (1875); 'Birds and Poets' (1877); 'Whitman, a Study' (1896); 'Squirrels and Other Fur Bearers' (1900); 'Ways of Nature' (1905); 'Camping and Tramping with Roosevelt' (1907).

BUTTER. Who was the first butter-maker? Perhaps he was an Arab who, after a journey on camel-back, opened the skin bags of milk which he had brought with him and discovered rich yellow masses of butter floating on top. Jolting cream in skin bags or gourds, carried on the backs of donkeys or dragged after a galloping horse, is an ancient method of butter-making which is still used in some parts of South America and in certain oriental countries.

Although butter was known at least 4,000 years ago, it did not become a staple article of food until comparatively recently. In early times it was made from the milk of sheep and goats by crude churning processes, and hence could have had little resemblance to the palatable and nutritious butter of today. It was chiefly used as medicine, as an ointment after bathing, and as an oil for burning in lamps. It was used to a certain extent in cooking, but olive and other oils were used more commonly for food, as is still the rule in southern Europe. It is now recognized that butter is a very important food, especially for growing children, who crave it in considerable quantities. Butter-fat contains valuable substances (sometimes called *vitamins*) necessary to vigorous health and growth, which are not contained in oleomargarin, made without cream or butter, or in lard and vegetable oils (*see* Vitamins.)



Good butter, as everybody knows, is made from good rich milk. But in order to pass the scientific test of the best butter, it must contain the elements in the proportions shown in this picture—85 per cent of fat, 1 per cent of casein, 3 per cent of salt, and 11 per cent of water.

In India and Central Asia a peculiar form of butter, called "ghee," is commonly used. It is much like the clarified butter used by orthodox Jews in *kosher* (ceremonially clean) cookery, being made by boiling the water out of freshly made butter and adding salt and sometimes sour milk and herbs. The people of Tibet are especially fond of butter in this form, even putting lumps of it into tea. (*See* Dairying.)

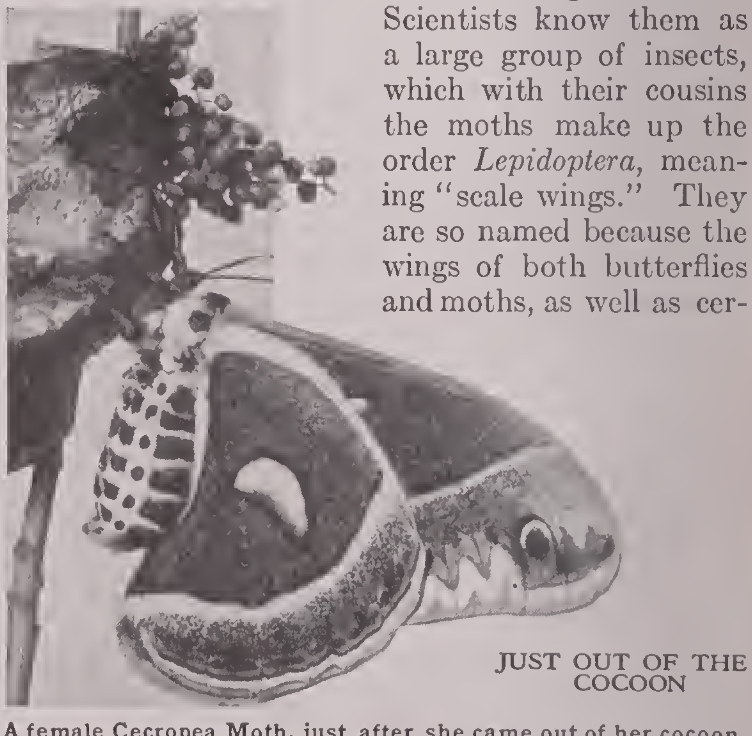
A portrait of little Miss Buttercup, taken as she stood dancing in the breeze of a sunlit field.

BUTTERCUP. Tilted by the breeze these bright little wild flowers flash and sparkle in the sunlight, lending to our meadows a dazzling golden glory. Shakespeare speaks of them as "cuckoo-buds of yellow hue" that "do paint the meadows with delight." They bloom in field and on roadside from late April until September, but June finds them at their best and in greatest profusion.

The buttercup belongs to the crowfoot family, and has bright green leaves and yellow flowers with five smooth shining petals. Of the better-known species, the first to bloom is the bulbous buttercup of field and roadside. It is followed closely by the swamp or marsh buttercup, which loves the moist, shady spots, and the common meadow variety, sometimes called the blister flower because its acrid juice causes blisters when touched to lips or tongue. This familiar little plant is a native of Europe, but now belongs quite as much to us, for it is found throughout the United States and Canada.

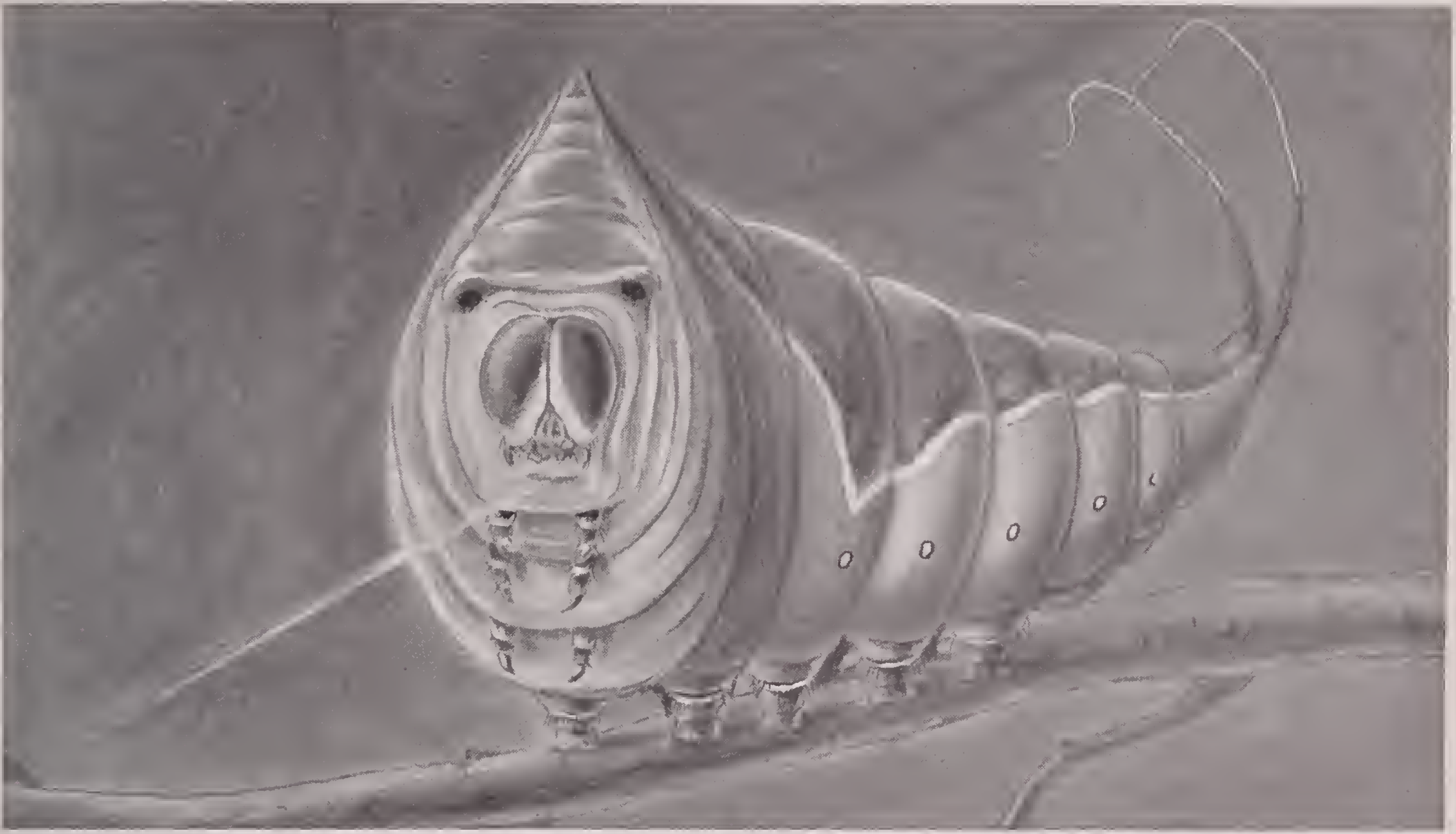
Scientific name of common meadow buttercup, *Ranunculus acris*. Flower about one inch across, with long slender footstalks; calyx has 5 spreading sepals; corolla 5 petals; stamens and carpels yellow. Stem erect, branched, and hairy; 2 to 3 feet tall, growing from fibrous roots. The leaves at the base grow in tufts with long petioles and are cleft into numerous lobes; stem leaves spring directly from the stem and usually have three parts.

BUTTERFLIES AND MOTHS. A poet has prettily called butterflies "stemless floating flowers." Scientists know them as a large group of insects, which with their cousins the moths make up the order *Lepidoptera*, meaning "scale wings." They are so named because the wings of both butterflies and moths, as well as certain portions of their bodies, are covered with a very fine soft glistening dust, which if examined under a compound microscope is seen to be made up of millions of little scales, of very pretty outlines. Some of these scales are very much like little feathers, some like fans; and all have a tiny stem by which they are fastened.



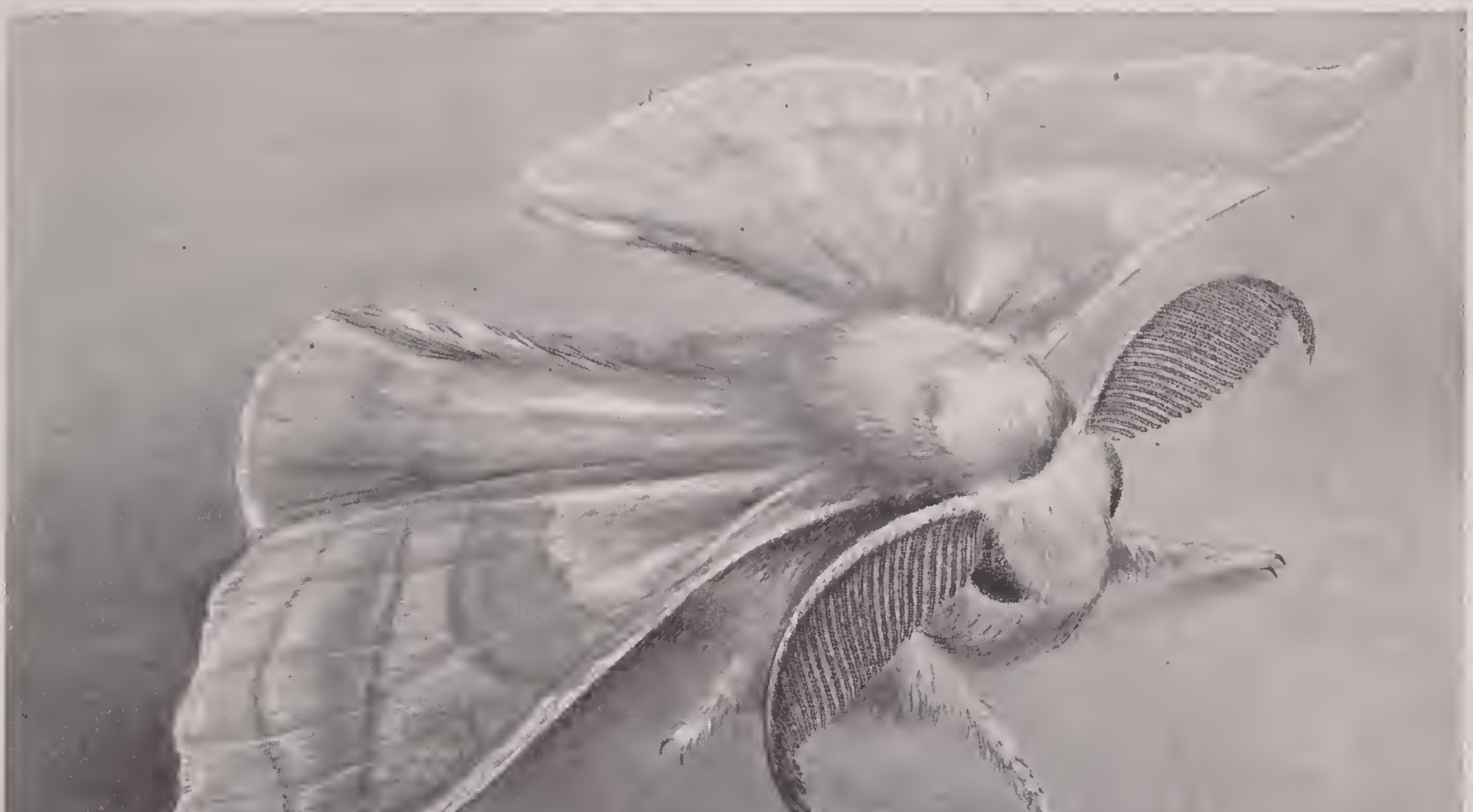
A female Cecropea Moth, just after she came out of her cocoon, is here shown resting near a cluster of berries, waiting for her wings to dry.

WHEN "PUSSY" GETS HER BACK UP



Of course you can see this is not a cat of any kind. Even in 'Alice in Wonderland' they didn't have cats like that. It's a Puss Moth Caterpillar and it seems to be angry, for it is spitting—and not just spitting like a cat, but really squirting out a jet of the poison fluid with which it drives off its enemies.

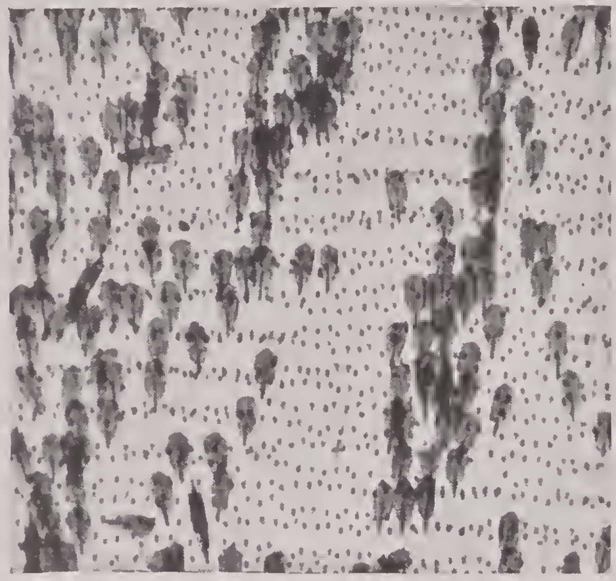
THE SILKWORM WHEN IT GETS ITS WINGS



Of course, you know the Silkworm is not a worm at all, but a caterpillar, which winds itself up in a cocoon of silky threads. We get our silk by unwinding these threads, a process which kills the pupa inside. But if left alone, it will come out looking just like this fine moth. Notice how furry it is. Moths usually have a much thicker coat of this soft down than butterflies.

Most of the butterflies fly during the daytime and sleep during the night; with the moths it is often just the reverse. A good way to distinguish between the moths and the butterflies is by the shape of the antennae or feelers. The antennae of the butterflies are thin and have their ends rounded into little clubs or knobs, while the antennae of the moths are not tipped by these knobs. Many of the antennae of moths are shaped like tiny feathers. In addition the butterflies usually hold their wings vertically over their backs when at rest, while the moths let them lie flat open.

THE “MOSAICS” ON THE LITTLE WINGS



The designs on the wings of butterflies and moths are made with little scales arranged in patterns. This highly magnified picture shows how the scales are set into the wing.

It is a mistake to think that the moths are all plain and sombre in color, while the butterflies are more brilliant. Some of the most beautifully colored members of the whole order are moths. One of our commonest moths, the luna moth, is a beautiful green color with a transparent center or “eye-spot” on each wing and long curved hind wings, and is surely as handsome as any butterfly. There are many more species of moths than there are of butterflies. In North America north of Mexico there are about 8,000 of the former and only about 700 of the latter. The butterflies, however, probably because they are more active in the daytime, are the best known to most people. They fly about from flower to flower and are often as prettily colored and fashioned as the blossoms they visit.

A butterfly has a long slender body, two long thread-like antennae or feelers on the front of the head, and six slender and fragile-looking legs. Upon its thorax, the middle section of the body, are two pairs of broad wings, covered with the tiny dustlike scales. It is these scales, indeed, that give the wings their beautiful colors. The front pair of wings is usually larger than the hind pair. The mouth consists of a long slender sucking tube which, when not in use, the butterfly keeps coiled up like a delicate watch spring. With this long tube it probes deep into the nectaries of flowers, where the liquid is stored, and drinks up this substance for its food.

A MOTH'S LEG

Moths have scales on the lower part of their legs and long silky hairs on the upper part.

The life history of the butterfly and the moth is almost identical. The female butterfly or moth lays a great many eggs, and from these hatch out tiny worm-like grubs, called caterpillar larvae (*see* Caterpillars). These grow rapidly, and shed their skins several times. Caterpillars crawl about among the leaves of plants and feed on them. They are very greedy creatures indeed, and do nothing but eat and fill their stomachs as full as they will hold. This food is stored up in the body in the form of fat, and is used to build up wings, legs, sucking tubes, etc., when the caterpillar turns into a butterfly or moth later on.

When the caterpillar feels within itself that the time has come for it to turn into a butterfly, it spins a button of silk, to which it clings. Hanging head down, it sheds its caterpillar skin, and then appears in compact form, a naked pupa called a chrysalis, which clings to the button of silk by a sharp spine at the end of the body. Some species spin a halter of silk as well as a button and thus suspend the middle of the chrysalis. The caterpillars of the moths spin themselves cocoons for the chrysalis stage.

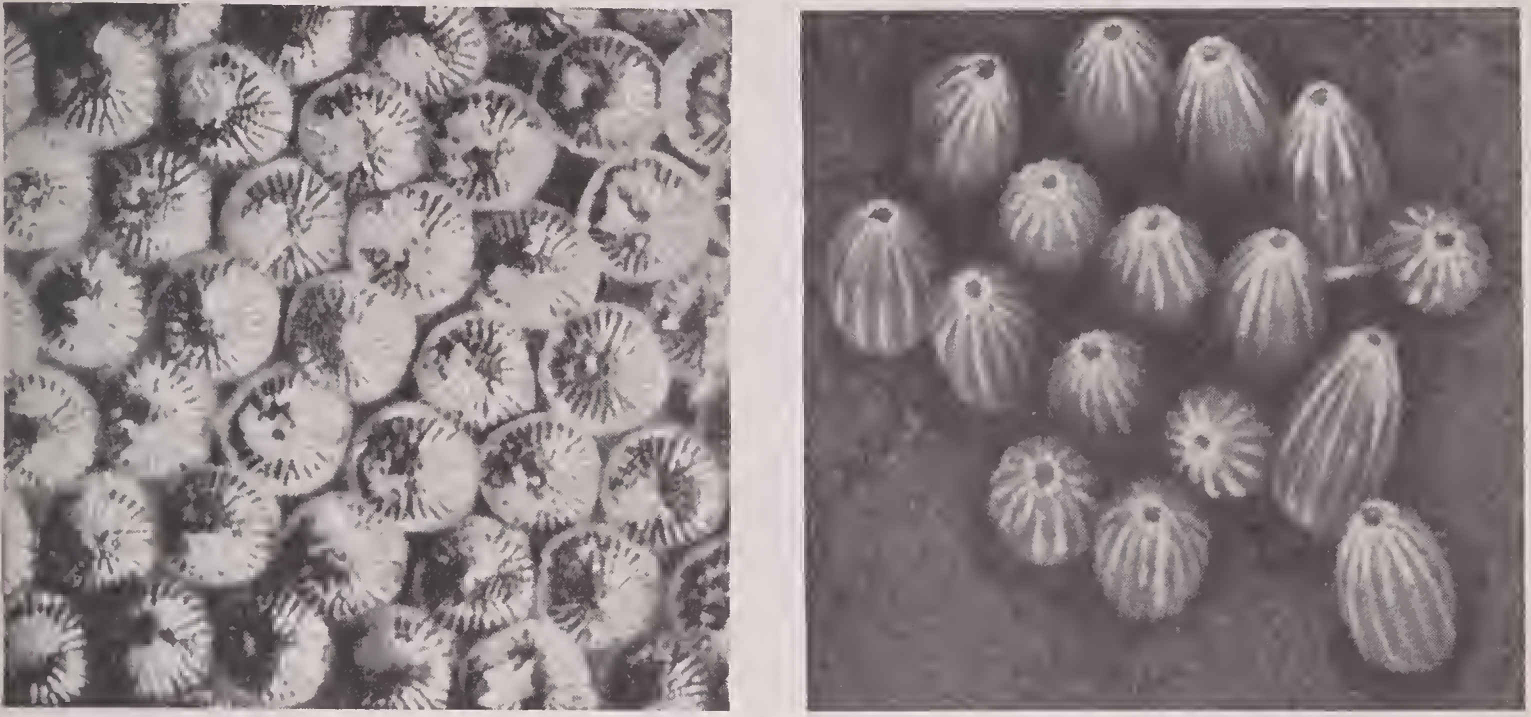
For some time (weeks or months) the pupa or chrysalis sleeps, and during its sleep it changes until it finally comes out a butterfly. When it first emerges from the chrysalid skin it sits still for some hours, in order to let its thin, moist, crumpled wings spread out. Then it waves them backwards and forwards slowly, to dry them, and finally flies away in search of nectar-producing flowers and its mate.

Among the butterflies of the United States the tiger swallow-tailed butterfly is one of the largest and most beautiful. The common small yellow butterflies that one sees about roadsides are the roadside species and in cabbage patches the white species is called the cabbage butterfly. Some of the butterflies, like the “mourning cloak,” live through the winter under leaves or in sheltered places. They may often be seen flying about during some of the very warm days during thaws.

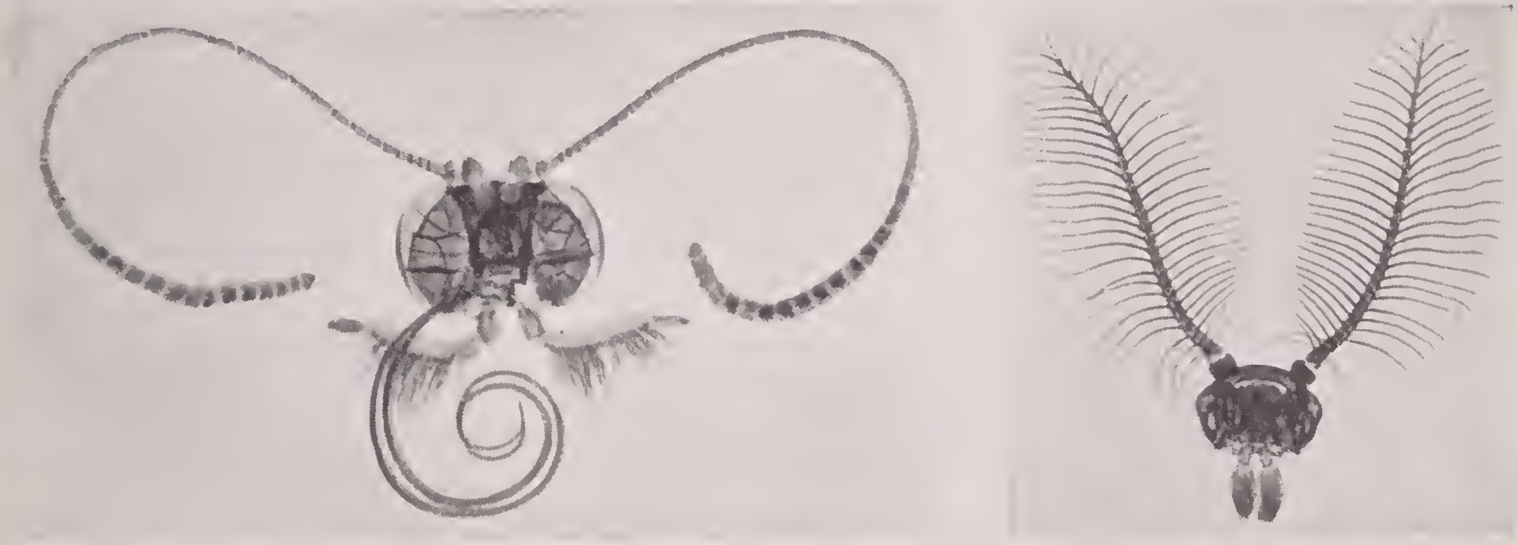
Many of the butterflies and moths which live in tropical countries are brilliant in color and very large. Some of the biggest of these measure as much as eight inches from tip to tip of the spread wings. and are as large as or larger than our winter wren.

Some butterflies are shaped and colored so as to

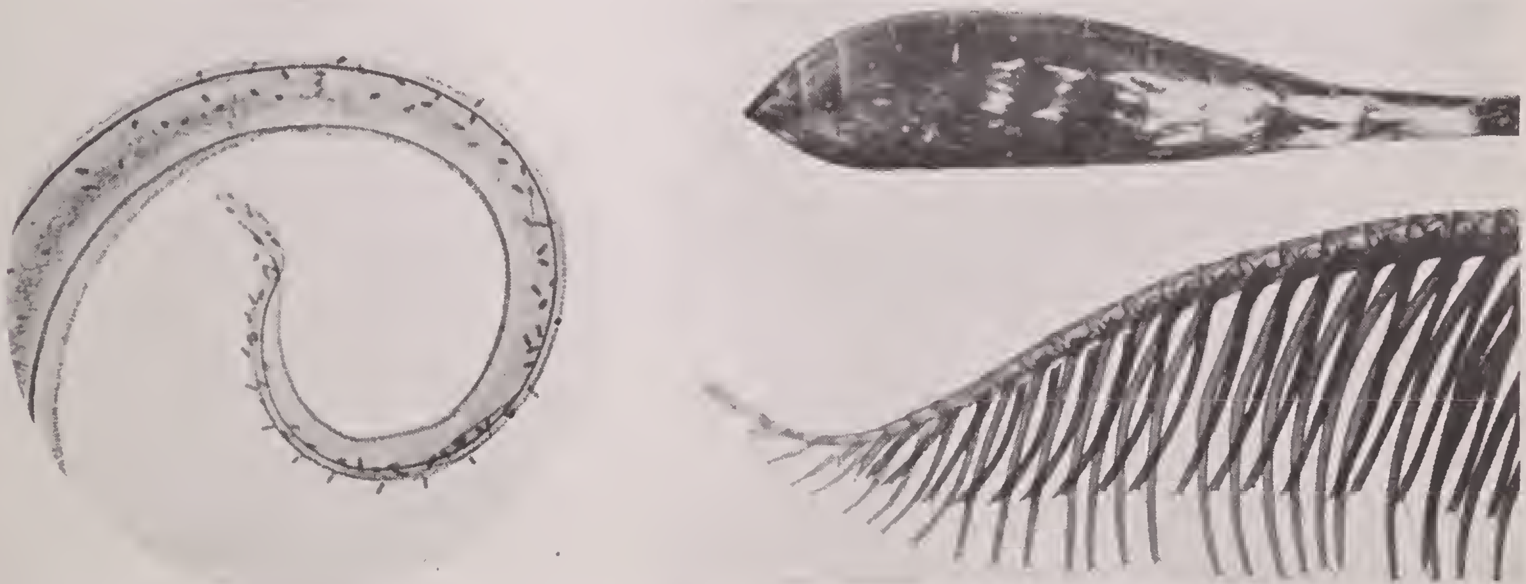
MARVELS OF BUTTERFLY AND MOTH LIFE UNDER THE MICROSCOPE



The eggs on the left were laid on plants by the Brocade Moth. You would suppose they were made to be looked at, they are so tastefully designed. But they had to be highly magnified in order to be seen at all. On the right are the eggs laid on cabbage leaves by white butterflies, similarly magnified.



Butterfly's head magnified, showing the big eyes beneath the long jointed antennae, the proboscis, and the feelers which guide it. When at rest the proboscis is curled up between the feelers. For comparison the antennae of a male moth are here shown at the right.

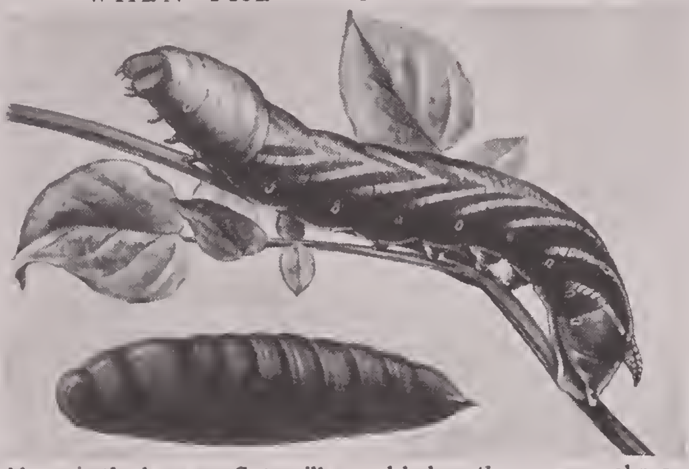


A moth's tongue under the microscope looks like the picture on the left. The dark spots and the little projections are probably taste organs. The upper of the two pictures on the right shows the end of a butterfly's antenna. Below is an antenna of the Tussock-Moth. Notice the elaborate jointing of the main stem and the fringe of hairs on each branch.

resemble parts of the plants on which they rest. The dead leaf butterfly of India, when perching on a twig with its wings closed, looks almost exactly like a dead leaf. This is to hide the creature and to protect it from its bird enemies.

Among the best-known moths are the silkworms, whose cocoons supply the silk of commerce. The caterpillars of some of the smaller forms of moths are very destructive to furs, woolen cloths, and other fabrics. Many larvae are destructive to crops and trees, annually causing great loss. The army-worm, cotton-worm, tobacco-worm, cut-worms, and tent-caterpillars are larvae of moths; the codling-moth, sphinx-moth, grape-berry-moth, grape-leaf-folder, plume-moth, tussock-moth, and others work much ruin.

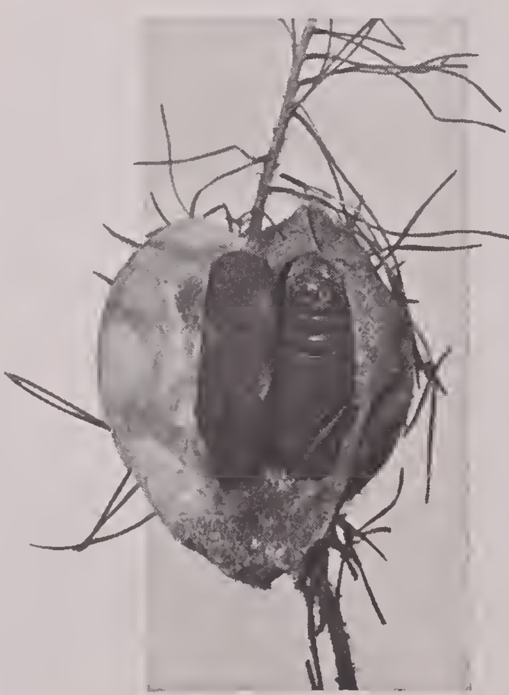
WHEN THE "WORM" TURNS



Above is the larva or Caterpillar and below the pupa, or chrysalis, into which the Caterpillar retires to come out later with wings. The wings of this particular Caterpillar, when he comes out of that wonder case, will have the markings which give him the name of "Death's Head" Moth.

The sphinxes or hawk-moths are very beautiful, but many of them are also very baneful. They are large and narrow-winged, visit flowers at dusk and frequently are mistaken for humming-birds. One member of the group is called the "death's head" moth, from the pale yellow markings on the thorax which look like a skull. The larvae of some forms, which are very large, work much havoc on the grape-vine, feeding upon the leaves; it is said that a single larva may strip or kill a small grape-vine in two or three days. The moths appear in July, laying their eggs underneath grape-leaf or leaf of Virginia creeper. The plume-moth is another enemy of the grape. Often one sees young grape-leaves curled up in little balls, examination of which will disclose the greenish-yellow larvae of the plume-moth. The vines should be examined daily, and the larvae picked off and destroyed.

The white-marked tussock-moth works much ruin on shade and fruit trees, stripping them of foliage. There are two broods a year. The cocoons are made in the trees, and the eggs are laid in a white frothy mass. These eggs are conspicuous, and should be destroyed. The gypsy-moth, introduced from Europe in 1869, has done enormous damage to the trees of New England, as has also its near relative, the brown-tailed moth. State and national governments have spent millions of dollars in combating these insect pests.



Here we see the construction of the silken covering which protects the pupa of most moths and butterflies from the cold and also attaches it to its resting place. The cocoon has been opened to show the pupa inside.

Butternut. This native American tree, sometimes called the white walnut, bears an oblong nut covered with a thin husk or hull and having a sweet oily kernel which is very palatable. The half-grown fruit is often used also for pickling. Little attention is paid to the cultivation of the butternut though the wood is most beautifully grained and firm, and is valuable for cabinet making and gun-stocks. From the bark and hulls of the nuts is obtained a dark brown dye. The tree has numerous spreading branches and smooth ash-colored bark. It is rather small, seldom attaining a height of more than 50 feet. The fruit is ripened in September and October. Scientific name, *Juglans cinerea.*

Buttons. We count the buttons on our coats to the old rhyme—

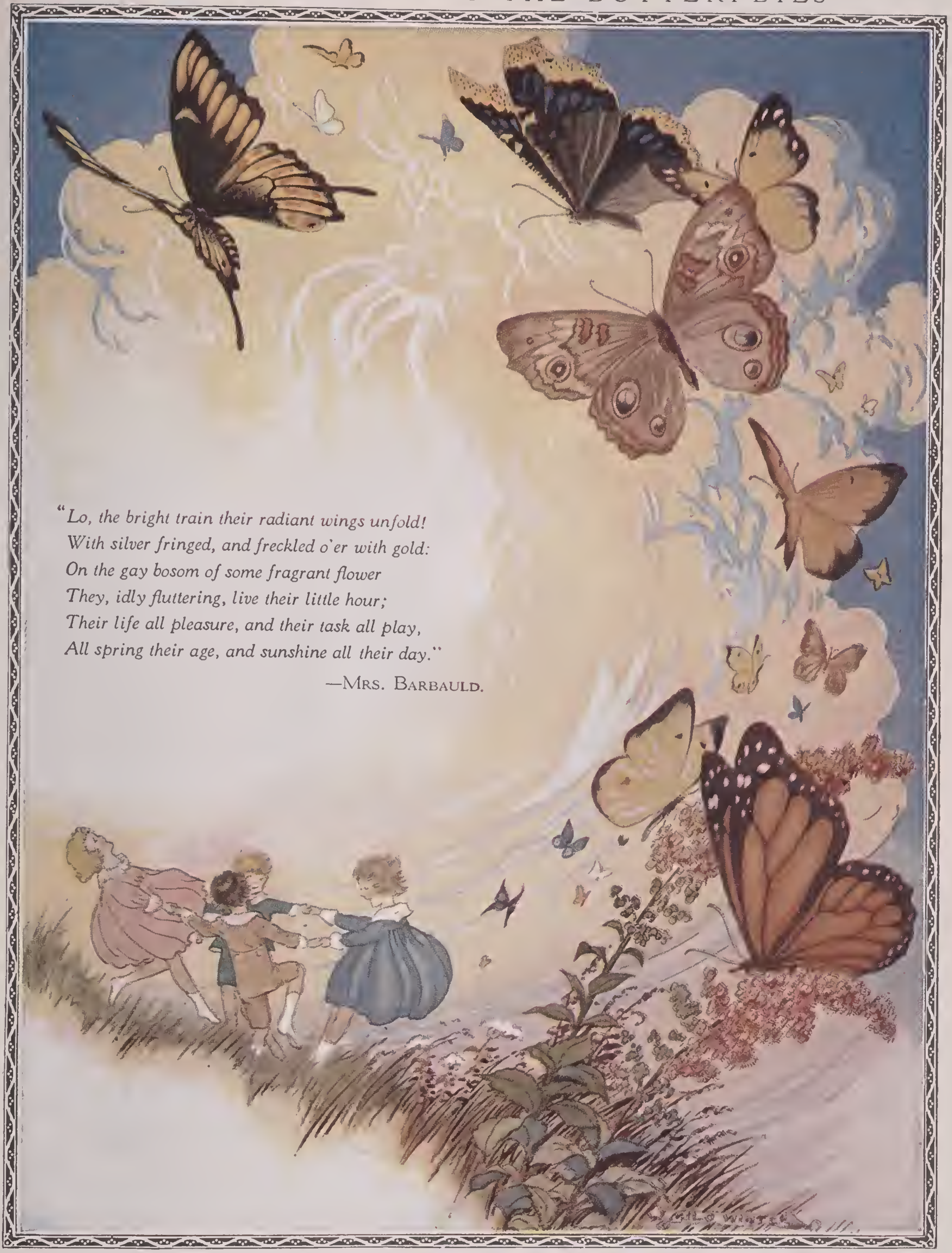
Rich man, poor man, beggarman, thief,
Doctor, lawyer, merchant, chief.

Even though the fortune which they foretell may not come true, buttons are nevertheless a very interesting subject for study.

In early times, clothes were fastened with pins, brooches, buckles, ties, and sashes or girdles. But as early as the 15th century it appears that someone discovered that a loop slipped over a button, or a button pushed through a slit in the cloth, would make a good clothes fastener. Buttons were also worn as ornaments, and those desiring to be dressed in the extreme of fashion would display a wealth of buttons sewed on their clothes, without regard to usefulness. For this reason some religious bodies, such as the stricter Mennonites in Pennsylvania and elsewhere, still forbid the wearing of buttons, and allow only hooks and eyes on the garments of their members.

Some buttons which seem only put on for ornament once had a very definite use. This is true of the buttons on men's coat sleeves, which were once used to button back the sleeves to leave the hands free; and those at the back of the frock-coat, which were used to fasten up the long skirts of the coat when riding horseback.

Buttons at first were very expensive. They were often made of gold, silver, or pearl, ornamented by designs and inlaid with precious metals and jewels.



"*Lo, the bright train their radiant wings unfold!*
With silver fringed, and freckled o'er with gold:
On the gay bosom of some fragrant flower
They, idly fluttering, live their little hour;
Their life all pleasure, and their task all play,
All spring their age, and sunshine all their day."

—MRS. BARBAULD.

Leading the merry air dance in his swallowtail coat is Papilio asterias, the common eastern "Swallowtail." The Papilio genus is known as the "Swallowtail" because almost all its members dress as formally as this handsome fellow. The gay ball clothes of the big butterfly just behind him, Vanessa antiopa, show beneath the "mourning cloak" from which he gets his popular name. Just back of him is Mr. Clouded Sulphur, the common "Puddle Butterfly." Madam Clouded Sulphur is sitting out this dance on a nodding flower-spike below with the handsome "Monarch" (Anosia plexippus), one of the "Milkweed Butterflies." Perhaps you did not know, often as you have seen the yellow wings of the clouded sulphur or common "puddle butterfly" gilding the cloverfields and moist places of the roadside, that it answers to the stately name of Colias philodice. Terias nicippe is the brownish butterfly with browner bordered wings, hovering over the head of the "Monarch." Just between Terias and half eclipsing the Clouded Sulphur with one of his splendid jeweled wings is the Buckeye Butterfly (Junonia caenia), one of the "Peacock Butterflies."

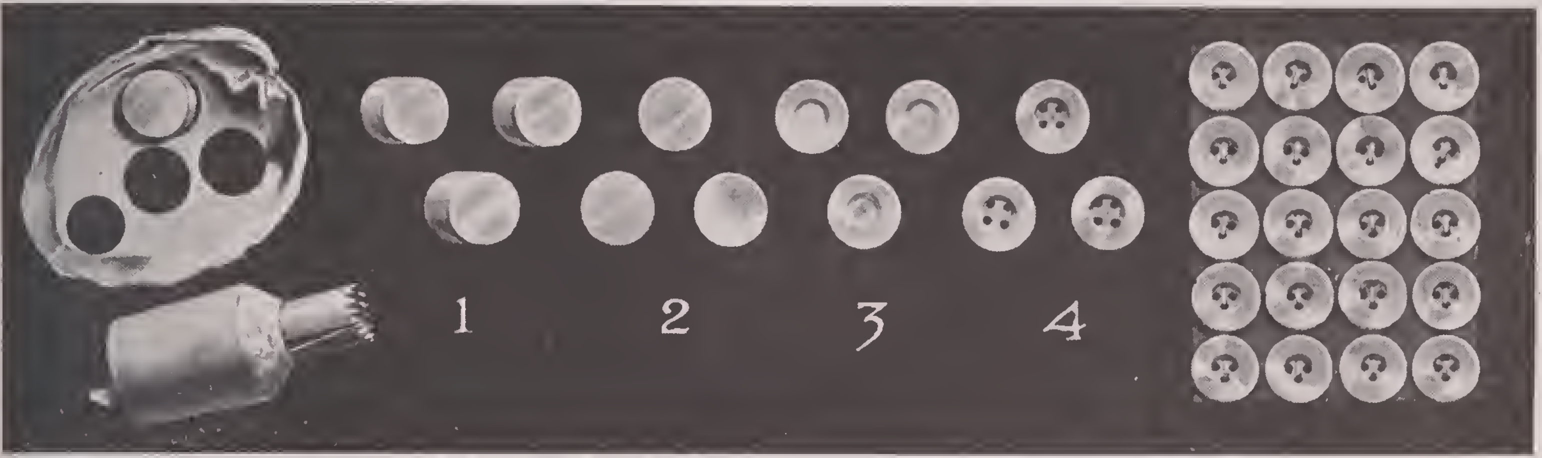
BEAUTY AND MYSTERY IN BUTTERFLYLAND

OH! WHAT a joy to be a child or a butterfly on a happy day of sunshine and merry winds! While a bee is all busyness because there is so much to do putting away honey for the winter, the butterflies haven't a care in the world. Nobody to look after but themselves, living on an occasional sip of nectar, they spend the livelong day flitting and drifting about like this in the golden air.

It is the "wondrous sculptured dust," the scales on their wings, that break up the rays of sunlight falling upon them and produce all the beautiful colors and shadings of butterflies and moths. But a long time before they get their wings—as time is measured in Butterflyland—these winged creatures of the sun are beautiful. If they celebrated Easter in Butterflyland, they wouldn't have to bother about coloring their Easter eggs; for the eggs of both butterflies and moths are not only remarkable for variety of form—they are round, oval, flat, barrel-shaped and bottle-shaped—but, in addition to the white eggs, there are lovely shades of green or brown.

But in hunting for these eggs, you may have to look sharp, for here, as elsewhere in Nature, Art is combined with Utility; that is to say, the eggs are usually of the color of the leaves to which they are attached, and this helps conceal them from enemies. So you see the butterfly doesn't dress up just to "show off." Not only have the eggs this protective coloring, but the larvae too are frequently protected by their similarity in color to the surrounding foliage. One theory is that the coloring of the leaves colors the caterpillar. But how a gaudy butterfly, like the Kallima of India, ever got put together so that the moment he settles on a twig and folds his gay wings he looks like an old withered leaf—that nobody knows! Possibly you may be the very boy or girl to find out some day. Many Nature secrets quite as mysterious have been solved by men of science who began by amusing themselves with Nature's puzzle pages just as you are doing this very minute.

HISTORY OF A PEARL BUTTON



The first thing in making shell buttons is to cut out what are called blanks by means of a tooth die which is fastened into a machine and comes down on the shell with a pressure and a twist, just as mother does when she cuts out cookies. Here we see three of the blanks (1), just as they are cut out, next (2) the blanks are ground down; then (3) a little pit is ground into the center; after which (4) the holes are drilled and the buttons sewed on cards.

They had to be shaped and decorated by skilled tradesmen, working painstakingly on one button at a time. In a modern button factory practically every operation in making many kinds of buttons is done by machines, which are so easily operated that boys and girls can run them. A great variety of materials are used in button-making—fresh-water mussel shells, ocean shells, vegetable ivory, cloth, bone, hoof, horn, brass, iron, steel, glass, agate, celluloid, porcelain, leather, paper board, and various kinds of composition.

THE IVORY THAT GROWS ON TREES

This is a burr containing the nuts from which buttons of "vegetable ivory" are made. These burrs which are the fruit of the Ivory Palm, are as large as a man's head. One of the nuts is shown at the right.

In the United States the button industry has an annual output of over $20,000,000. It centers in five states—New York, Iowa, New Jersey, Pennsylvania, and Connecticut. New York leads with more factories than all the other states put together.

Where Our Pearl Buttons Come From

Fresh-water pearl buttons, made chiefly from the mussel shells of the Mississippi River, are the most important class, both in quantity and value, produced in the United States. With proper attention the supply of these shells will endure indefinitely. Their manufacture was established in 1890, before which most of the pearl buttons in this country were imported from Austria-Hungary and Germany. Within 25 years the imported article had been practically eliminated from the home market. However, the Japanese have now begun the manufacture of pearl buttons, using the *dobugai* shells taken from the inland lakes of China; and owing to the cheapness of Japanese labor these buttons can be produced at a lower cost and compete seriously with the American product.

The button is first cut in the "ivory," while it is still inside the nut.

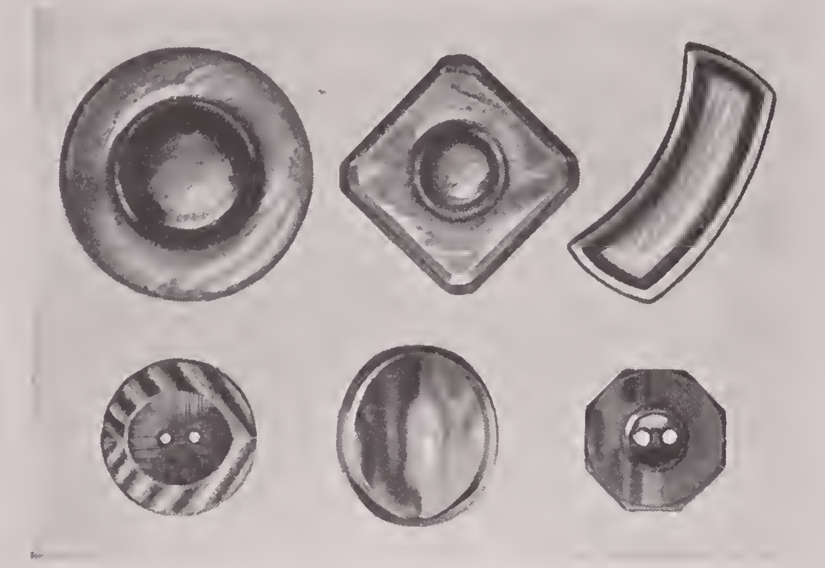
Ocean pearl buttons are made chiefly from the white shell from West Australia, the yellow shell from Manila, and the black shell from Tahiti. These buttons are used principally on better grade shirts, shirtwaists, skirts and dresses, and underwear, while the fresh-water buttons are used on medium and cheaper grades. Machines cut out the button pieces from the shell with tubular saws, split them into discs, drill the holes for fastening the buttons, and smooth and polish them—all with practically no hand labor.

Vegetable ivory buttons are the next in importance. They are made from *tagua* (also called *corozo*) nuts, obtained principally in Ecuador, Colombia, and Panama. The nuts, which are covered with a hard shell, grow in heads of 10 to 30 together, and vary in size from a hickory nut to a a large horse-chestnut, the smaller varieties having the finer texture. The seeds of the *palma dum* growing in

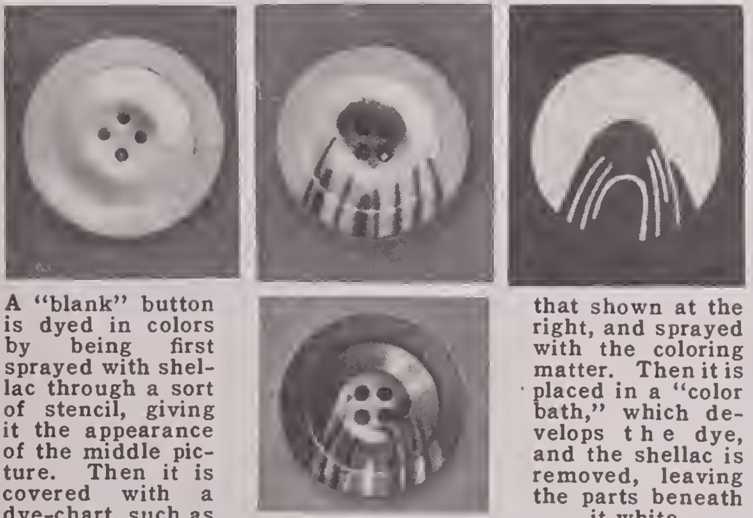
Then the shell is removed, as shown here, and the button is ready for drilling.

upper Egypt are used to some extent as a substitute for the tagua nut by Italian manufacturers, but these are said to be less satisfactory than the South American product. The tagua nuts are dried from three to six weeks, the hard shells removed in revolving drums, the nuts cut into slabs, and after a moist bath to prevent cracking they are turned on lathes into button blanks. They are then shaped, drilled, and polished somewhat like the shell buttons. They are very easily dyed, and are often made to resemble the cloth upon which they are to be worn. Over 50,000,000 pounds of tagua nuts are imported into the United States each year. The chief centers of this manufacture are Rochester, N. Y., and Newark, N. J.; about 10,000 people are employed in the factories. The ivory buttons are purchased in large quantities by the clothing trade for use on men's and boys' coats, vests, trousers, and overcoats, and on women's suits and coats.

TYPES OF FANCY BUTTONS



Button manufacturers, like the manufacturers of the clothes on which the buttons are to go, exercise their artistic ingenuity in constantly devising new and attractive forms. Here are six examples. Some of the "art" buttons are very expensive.



A "blank" button is dyed in colors by being first sprayed with shellac through a sort of stencil, giving it the appearance of the middle picture. Then it is covered with a dye-chart, such as that shown at the right, and sprayed with the coloring matter. Then it is placed in a "color bath," which develops the dye, and the shellac is removed, leaving the parts beneath it white.

A large proportion of the manufacturers of metal buttons receive their metal prepared in sheets ready for cutting into blanks. Power presses cut blanks for fronts and backs. Patterns are then stamped on them and the buttons are assembled and polished. There are also cast-metal buttons made by pouring molten metal into molds of different sizes and designs. Various patent buttons are made which do not have to be sewed on. They are usually in two pieces, with a shank on one piece which goes through the cloth and fastens by means of a spring clip in the other half on the other side of the cloth.

Bone buttons are made from the shin bones of cattle. In the United States the packing houses furnish the great bulk of the material used in their manufacture. They are used mainly for underwear, waists, and children's clothing. Cloth and silk buttons are made by covering wooden forms or metal discs. The work of covering is now done by machinery.

Glass buttons are made in infinite variety and color, and there is no limit to the patterns that can be produced. They are chiefly of the novelty type, and the nearest to a standard is the jet glass button. Bohemia has been the home of the glass button industry for many generations, and the skilled workmen guard the secrets of the trade, which have been handed down from father to son ever since the industry was started.

The ordinary shoe button is made of papier-mâché. In the process of manufacture the buttons are saturated with linseed oil or amber varnish, to give greater firmness; they are then dried, again coated with hot amber varnish, and baked. In finishing they are polished with pumice, given the desired coating of color, dried and again coated; and this process is repeated for three or more coats.

BUZZARD. The turkey-buzzard is the scavenger of the South. He works for just his board and his whole family help him; and they are protected by law and given the freedom of the town and country. In some southern cities these birds, which are related to the vulture, are seen walking about the streets ready to claim any decaying flesh or bit of offal.

A Turkey-Buzzard is one of the most graceful creatures in the world while on the wing, but on the ground it is one of the most hideous and repulsive of birds.

In the country, as far north as Manitoba and westward to California, buzzards congregate in numbers about dead animals. As Uncle Remus says, "All de buzzards in de settlement'll come to de gray mule's funer'l."

The turkey-buzzard's most remarkable characteristic is his keen vision. His eyesight is many times more powerful than that of man. Flying so high that he is almost out of sight, a buzzard will suddenly swoop down onto a dead animal, no larger than a cat, which he has been able to see from that great distance.

The turkey-buzzards are about two feet long, with a wing span of five to six feet. At close range they are very ugly, for they have rusty black untidy feathers, a bare head and neck, and a slow stupid manner. But when seen poised in mid-air, with outspread motionless wings, the buzzard is so imposing that one forgets his repulsive habits. (For illustration in colors *see* Birds.)

Besides the turkey-buzzard, which is a member of the vulture family, the name "buzzard" is given to various hawks of quite different appearance and habit (*see* Hawk).

Scientific name of turkey-buzzard, *Cathartes aura septentrionalis;* black buzzard, *Catharista urubu.*

BYRON, GEORGE GORDON, LORD (1788–1824). From his cradle the famous Lord Byron, one of England's greatest poets, was marked out for unhappiness. Though he was the scion of two noble families—one Scotch, one English—he enjoyed few days in the 36 years of his eventful life, crowded with adventures and sensational incidents, that were not embittered by pain and sorrow.

The misfortune that clouded his career was a lameness resulting, some surmise, from an attack of infantile paralysis. Unlike the sweet-tempered Sir Walter Scott, who also was lame, Byron brooded on his infirmity until it poisoned his whole existence.

"What a pretty boy Byron is!" a friend of his nurse once thoughtlessly remarked in his presence. "What a pity he has such a leg!"

Like a flash the child turned and slashed her with his toy whip, crying passionately in the Scotch dialect of his boyhood:

"Dinna speak of it!"

This was Byron's attitude throughout life; he was always turning on the world and savagely assailing it for some real or fancied grievance. In most of his work we see a scowling brow and a curling lip. When his first volume of poems—published at the age of 19—was severely criticized by a reviewer, Byron savagely attacked not only his critic but the whole generation of literary men, in 'English Bards and Scotch Reviewers', one of the most scathing satires in the English language.

After a tour of Spain, Greece, Turkey, and other lands, Byron published the first two cantos of 'Childe Harold's Pilgrimage', and, to use his own words, "awoke one morning to find himself famous." He had become the hero of the hour. Fashionable society received him with open arms. Women worshiped him, and young men imitated him by wearing the well-known open collar and flowing tie which the poet affected, and posed as melancholy romantic heroes, like those which Byron pictures. Even greater was his following on the Continent, especially in Germany, where he was hailed as second only to Shakespeare among the English poets.

But Byron's personal popularity was soon to end. When his wife left him a year after their marriage, society turned against him, and Byron, disappointed and embittered, left England, never to return.

"Nothing in his life became him like the leaving of it." Byron's death was such as he would have chosen for himself. He gave his life on the altar of freedom, dying of a fever while serving in the war of Greek independence against Turkey.

Byron passed judgment on himself when he wrote of one of his heroes:

> This should have been a noble creature: he
> Hath all the energy which would have made
> A goodly frame of glorious elements,
> Had they been wisely mingled; as it is,
> It is an awful chaos—light and darkness,
> And wind and dust, and passions and pure thoughts
> Mixed, and contending without end or order.

Byron's chief works are: 'Hours of Idleness' (1807); 'English Bards and Scotch Reviewers' (1809); 'Childe Harold's Pilgrimage' (1812-18); 'The Giaour' (1813); 'The Bride of Abydos' (1813); 'The Corsair' (1814); 'Lara' (1814); 'Manfred' (1817); 'Don Juan' (1819-1824); 'Cain' (1821).

BYZAN'TINE EMPIRE. For more than a thousand years after Rome, "the Eternal City," had fallen before the hordes of northern barbarians, the Byzantine Empire, with its capital at Constantinople, stood as a bulwark protecting Europe from similar or worse floods of invasion from the East. There the learning and culture of ancient Greece and Rome were preserved for later generations. There, too, commerce was kept alive until barbarism and feudal anarchy were things of the past, and commercial cities had arisen in Italy, France, and Germany to carry on the torch of progress.

Why Constantinople Astonished the Crusaders

When the Crusaders from western Europe arrived on the shores of the Bosporus, at the close of the 11th century, they were astonished to find Constantinople an enormous city of a million inhabitants at a time when no town of the West had more than a few thousand population. They were amazed at the paved and lighted streets, extensive public parks, hospitals, and homes for orphans. They found order kept by a well-organized police force, and theaters and circuses maintained by the state for the amusement of the people. There were flourishing schools in which the pupils studied not merely the elementary subjects taught in the West, but also those of law, medicine, and science. Art and learning were far in advance of what the West could boast, and the Byzantine nobles lived in magnificent palaces, beautifully decorated in mosaics and containing libraries of illuminated manuscripts. Even the artisans were comfortably housed, and worked together in great factories producing the rich stuffs which were so rare and so highly prized in the West.

In 330 A.D. the emperor Constantine had removed his capital from Rome to Constantinople, but the real history of the Eastern or Byzantine Empire did not begin until 395, when the division of the Roman Empire into an eastern and a western half became permanent. At the time of its greatest glory under the emperor Justinian (537–565)—famed for his codifying the Roman law—the Byzantine Empire extended from southern Spain in western Europe to the Tigris-Euphrates valley in Asia, and from the Danube River on the north to upper Egypt on the south. But a decline soon set in. In the centuries after Justinian, ruler followed ruler in rapid succession. Egypt, Syria, and most of Asia Minor were lost to the newly-risen Mohammedan power.

In response to the emperor's call to the West for help, there began the great movement known as the Crusades. But crusading friends proved more dangerous than the Mohammedan foe.

Treachery of Crusaders and Decline of the Empire

In 1204 the Fourth Crusade, at the suggestion of Venice, was openly turned against Constantinople. The Crusaders deposed the emperor, terribly sacked the city, and there set up a fleeting Latin empire in place of the Greek one they overthrew. It was at this time that many of the great works of art, such as the four bronze horses which still adorn St. Mark's Church in Venice, were carried from Constantinople to western Europe.

After some 50 years the people of the Byzantine Empire were able to drive out their so-called friends and restore their own ruler. For about 200 years more they held at bay the Turks, who were urged on by religious zeal to the conquest of Europe. But neither the splendor nor the power of the Eastern Empire were ever again what they had been before the treacherous attack of the Fourth Crusade.

For a hundred years the Mohammedan Turks, after over-running all Asia Minor, slowly closed in on the doomed city of Constantinople. At last on May 29, 1453, a breach was made in the walls and the emperor Constantine XIII was killed as he defended the last rampart of his capital. The Ottoman Turks then took the city, and the crescent of the Mohammedans replaced the cross on the church of St. Sophia. The Byzantine Empire was at an end.

After the reign of Justinian, Greek was the official language of the Byzantine Empire, and even Justinian found it necessary to publish his later laws in Greek rather than in Latin, his mother tongue. No great literature thereafter was produced in either language. The writers of the empire had lost their originality and produced chiefly huge encyclopedias made up of condensations of the ancient learning. In this way classical learning was preserved, but after it had been stored in the encyclopedias writers paid little attention to the old manuscripts and many of the most valuable ones were lost.

Byzantine Art and Architecture

At the same time that literature lost its originality, Byzantine art became stereotyped. Because the pagans in their worship used images, the stricter Christians of the East refused to sculpture the human form, and it was not until about 1000 A.D. that small reliefs and icons of ivory, gold, and silver were made. Since they could not express themselves in sculpture, the artists of the Byzantine Empire turned to architecture. Situated between the East and the West, Byzantium borrowed from both. It contributed as its own device the numerous bulbous domes such as are seen on the churches of St. Sophia at Constantinople, St. Mark's in Venice, at Ravenna, and the modern churches of Russia.

But the splendor of Byzantine art lay chiefly in its oriental use of color. Byzantine paintings are stiff and inexpressive, but are richly colored; while the gorgeous red, blue, and gold used in illuminating the missals and other religious books make them superb works of art. The vestments of the clergy were also splendidly embroidered with gold and silver thread and even jewels. And on the walls of the churches and public buildings Bible scenes were depicted in wonderful mosaics, in which gleaming figures, made up of hundreds and thousands of red, blue, green, and white stones and bits of glass of many hues, shone against a golden background. Never in all the wonderful architecture of the Mohammedan world—where such gems as the Taj Mahal in India are plentiful—has such a brilliant concept been embodied as St. Sophia, with its domes and gorgeous mosaics.

C

CABBAGE. Cauliflower and kale, Brussels sprouts and kohlrabi, cabbages and turnips, radishes, mustards, and watercress—what a big and useful family of plants we have in the cabbage and its numerous relatives!

TWO MEMBERS OF THE CABBAGE FAMILY

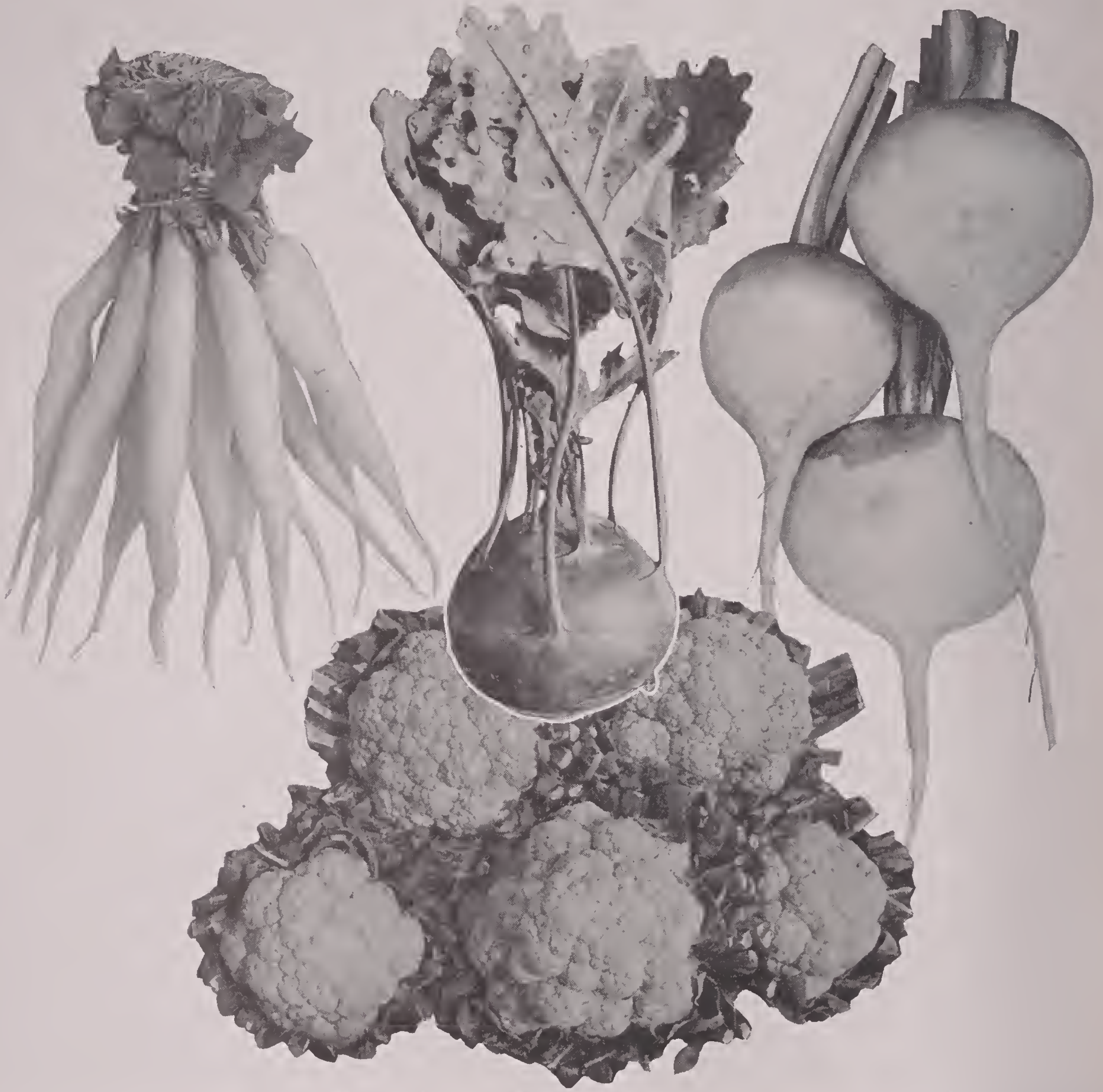
Nothing could better illustrate the wide range of "talent" in the Cabbage family than this picture contrast between the big common round-headed Cabbage and Brussels Sprouts, with their "baby Cabbages" crowding together all over the stalk. Yet, these are only two of the wide varieties of Cabbage forms in the great world of vegetable life.

Cauliflower, someone has said, is "a cabbage with a college education"; that is, it is a cabbage plant which has been carefully cultivated for centuries until it developed a very tight head of delicately flavored "flowers," delicious to eat either boiled or pickled. Kale is a member of the same family which runs to foliage instead of flowers, producing crinkled succulent leaves, which we eat as greens or feed to cattle. In Brussels sprouts (so named because it was cultivated long ago near Brussels, in Belgium) we have a plant that bears a number of delicate leaf-buds an inch or so in diameter along the length of its tall thick stalk. Kohlrabi, on the other hand, is a variety that took to storing up nourishment in its thickened stem, until the stem became a turnip-like globe that sits on top of the ground, and makes very good food for both human beings and cattle. Another extraordinary member of the family put its vigor into the stem by shooting as tall as possible, instead of swelling out like the kohlrabi. This is the Jersey cabbage or tree cabbage, that grows eight or ten feet high in the Channel Islands, and has a stout stem that is used for walking sticks and rafters in cottages; its leaves do not close into heads but are used as fodder for cattle.

In the cabbage proper we have a descendant of the wild cabbage that puts its strength only into the terminal leaf-bud, which forms the swollen compact head we so often eat raw, boiled, or pickled with salt in the form of sauerkraut. Cultivation has developed more than 100 types of cabbage—smooth-leaved and wrinkle-leaved (also called Savoy); green and red; with heads conical, oblong, round, or flat. Scientists tell us that cabbages yield a greater weight of green food to the acre than any other plant, and that there is no better fodder for cattle and sheep.

You can tell that all these descendants of the wild cabbage are related to the mustard plant, both by the resemblance of the flowers and by the biting mustard-like flavor that their stems have to a greater or less degree. The young mustard plants are sometimes eaten as salad, but they are chiefly cultivated for their white or black seeds, which are ground to make our familiar powdered mustard. Radishes also are near cousins of the mustard, with the hot biting taste usually well developed. Their globular or elongated roots are delicious as relishes or in salads, and in Europe the young leaves and the seed pods are also eaten. Watercress and other kinds of cress, which are among our popular salad materials, also

ANOTHER CABBAGE FAMILY GROUP



The first picture on the left you recognize as the long whitish variety of Radish which, with its nice crisp biting taste, adds so much to the pleasures of the table in the spring. Next is the Kohlrabi which, in contrast to the underground root of the Radish, stores its food above ground in the stem until it becomes a globe. Next is the round fleshy root of the Turnip, one of the most valuable of all our root crops; and below the Cauliflower, which has been called "the cabbage with a college education."

betray their membership in the mustard family by their flavor. The horseradish, with its tear-bringing taste, is a coarser relative of the radish and the watercress. Its white fibrous root is grated and steeped in vinegar with salt and sugar to make the condiment often eaten with meats; it is often mixed with grated turnip root to make it milder.

The same mustardy taste is conspicuous in the turnip before it is boiled. The turnip is one of our most valuable root crops for both human and animal food, even though it is nine-tenths water. The tender tops of early spring turnips are also good boiled as greens. Several varieties have been developed, distinguished by their color, size, and shape. The rutabaga or Swedish turnip is the large yellow variety grown in northern latitudes. The garden varieties grown for human food are generally smaller, tenderer, and more delicately flavored than the field turnips, grown chiefly for cattle feed, which sometimes attain a size of 20 to 25 pounds.

The botanical name of the large family which includes the foregoing useful plants is *Brassicaceae* (also called *Cruciferae*). This group also embraces various ornamental flowers, such as the wallflower, rocket candytuft, sweet alyssum, and the curious rose-of-Jericho or resurrection plant. The resurrection plant, which grows in the desert regions about the Red Sea, has the strange property of curving its branches into a ball about the seed-pods after the leaves fall, ready to be blown hither and thither by the wind. When it reaches a moist place the branches expand and the pods open and release the seeds.

There are about 215 genera and 2,000 species of the *Brassicaceae* dispersed throughout the temperate regions.

Some are annuals, some perennials, but all have the characteristic pungent watery juice. The flowers have 4 usually deciduous sepals and the 4 regular petals are hypogynous (that is, growing from the axis beneath the ovary or pistil) and are arranged so as to suggest the form of a cross (hence the name *Cruciferae*, meaning cross-bearers). Two of the 6 stamens are shorter than the others and have a lower insertion. The seeds are without albumen; leaves alternate and without stipules; fruit a 2-celled pod. Scientific name of cabbage, *Brassica oleracea*; of cauliflower, *Brassica oleracea botrytis;* of Brussels sprouts, *Brassica oleracea*, var. *bullata gemmifera;* of radish, *Raphanus sativus;* of turnip, *Brassica campestris* and *Brassica rapa;* of white mustard, *Brassica alba;* of black mustard, *Brassica nigra;* of garden cress, *Lepidium sativum*.

CABINET. When an important question is to come before the British House of Commons, all eyes in the crowded assemblage are turned to a little group of men who occupy the front benches at the right of the Speaker or presiding officer. These are the men who will propose the course the government has agreed to follow, for they, with other members from the House of Lords, constitute the cabinet. Their proposals are almost sure to be adopted, for they are the leaders of the majority party in the Commons. And when the measures are passed, the members of the cabinet, who are also the heads of the great administrative departments of the government (foreign affairs, war, navy, etc.), will be responsible for putting them into execution. Each member of the British cabinet is thus (1) a member of the council or committee which shapes the policy of the government, (2) a leader of the dominant party in the upper or lower house of Parliament, and (3) usually the chief of a great administrative department as well.

The cabinet has therefore been defined as "the link that binds together the legislative and executive branches." It is really a steering committee of the party which has a majority in the House of Commons. The prime minister, as its head, is the undisputed leader of his party.

If for any reason a majority in the lower house should refuse to follow the lead of the prime minister or should vote against a bill which the cabinet has proposed, one of two things happens. Either the cabinet resigns, and the opposition party takes over the management of the government; or else the king is advised to dissolve the House of Commons and hold a new election. This is really a referendum vote of the country on the question at issue. If the majority of the new house agrees with the cabinet, the ministers remain in office. But if a majority still opposes it, the cabinet must resign and a new one at once takes its place. The members of the former cabinet then become leaders of the opposition in Parliament.

Under the present system of government it is to the prime minister and the cabinet, rather than to the king, that the people of the country look for direction, for the king can do nothing without the approval of his ministers. This system of responsible cabinet government has been copied by England's self-governing colonies, such as Canada, Australia, and New Zealand, and by many other nations, including France, Italy, Belgium, etc. Its greatest merit is that it concentrates responsibility and prevents interminable disputes between the legislative and the executive branches.

Legally the British cabinet is only a committee of the privy council, but the committee is now more important than the council. All the members of the latter meet only at the beginning of a new reign or when the reigning sovereign announces his or her marriage. Membership in the council, which is usually for life, is often given now to distinguished persons as a mark of honor, while all the cabinet officers and ministers become councilors by virtue of their office. The ministry includes not only the members of the cabinet, but also other important officials who go out of office when the cabinet resigns.

When we talk of "the cabinet" in the United States government, we mean quite a different arrangement. The president appoints (subject to confirmation by the Senate) the heads of the great administrative departments—the secretary of state, secretary of the treasury, secretary of war, attorney-general, postmaster-general, secretary of the navy, secretary of the interior, secretary of agriculture, secretary of commerce, and secretary of labor—and from time to time he calls these men together as a "cabinet" and asks their advice. But they are not members of Congress, nor do they appear in Congress to speak to either house. They are responsible only to the president, and he may dismiss them at any time. Nor is he required to take their advice if it is contrary to his own judgment. This is illustrated by an incident told of Lincoln. At one time he brought before the cabinet a proposition which he favored, but every member of his cabinet voted against it. He announced the vote thus: "Seven nays, one aye; the ayes have it."

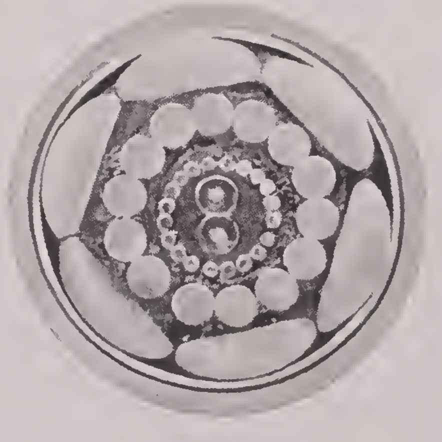
Most important of all, the president and cabinet (who correspond to the prime minister and cabinet of Great Britain) do not have to resign if their policy is rejected by Congress. On the other hand, the president cannot order new elections at any time that he wishes the people to judge between him and Congress. So conflicts between the legislative and executive branches in the United States are very common.

There is no provision in the United States Constitution for a cabinet to advise the President, although in two places mention is made of the heads of departments. Washington at first turned to the Senate as a council to advise with him, but this plan proved impracticable. Then for a time he followed the practice of asking the advice in writing on specific questions of his secretaries of the treasury, state, and war, the attorney-general, chief justice, and Vice-President. On April 4, 1791, he wrote a letter to the secretaries of state, treasury, and war which brought about the first cabinet meeting in American history. But not until two years later did this precedent develop into frequent consultations at a fixed place—usually the President's house. Jefferson, as secretary of state, first wrote of the President's council as "our cabinet" in 1793, and the term gradually became common from the English practice. But the word cabinet has never been introduced into the laws. President Harding in 1921 went back to the early practice of Washington by inviting Vice-President Coolidge to the cabinet meetings.

The CABLES *that* BIND *the* WORLD TOGETHER

How the Seas were First Bridged for Electric Communication

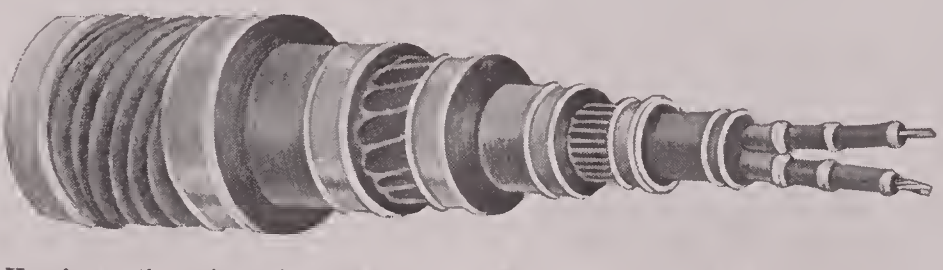
The cable's job is interfered with in many ways. Marine plants and animals fasten themselves to it and frequently cause damage. The teredo, a small shell-fish, is particularly destructive, boring through the gutta-percha insulation and thus exposing the copper wire. Sometimes a wandering whale gets mixed up with the cable and it is damaged in the struggle. It is at times broken by trawlers while dragging large fish-nets weighted down by heavy iron-shod beams.



Cross section of a cable. This shows you how the small copper wires are protected in the center of the heavy cable.

CABLES, SUBMARINE. If you would visit the bed of the Atlantic between the United States and Europe, you would find a number of stout gutta-percha covered cables lying in the slimy ooze of the ocean floor, stretching from land to land. These are the submarine electric cables over which the New World and the Old still send their telegraphic messages to each other, in spite of the growing use of "wireless." They are the wonderful cords that bind the modern nations into one great group, so that a business man in New York can send his order to London and get a reply, sometimes within the space of three minutes.

Similar cables connect us with South America, with Alaska, with the Philippine and Hawaiian islands and other islands of the Pacific, with Australia, Japan, China, and India. Every important seaport in the world is linked with this great cable system, so that the remotest points of civilization are now in closer communication than were parts of the same country before the invention of the telegraph and telephone. In all there are enough miles of submarine cables to girdle the globe 13 times, and the cost of laying them amounted to over a quarter of a billion dollars.



Here's another view of the cable with various layers cut away, showing the copper conductors over which the current is transmitted, the gutta-percha insulation, the brass tape to prevent the teredo from boring in, and the jute yarn to serve as a bed for the galvanized iron wires which are wound around the cable to give it strength.

Telegraphing under water is quite different from telegraphing on land. For one thing water is a good conductor of electricity, and so the wire carrying the current under water must be very carefully insulated. The only effective material for this purpose is gutta-percha, which was fortunately introduced into this country and Europe soon after the invention of the telegraph, thus making submarine telegraphy possible. An ocean cable must also be very strong and durable, to withstand injuries from rocks, ships' anchors, and the attacks of great fish like the shark and swordfish.

The cables used today consist of a core of seven or more copper wires, insulated by gutta-percha and surrounded by several layers of protective wrapping. This wrapping is made of layers of jute yarn, saturated with a bituminous compound, and a sheath of small cables each com-

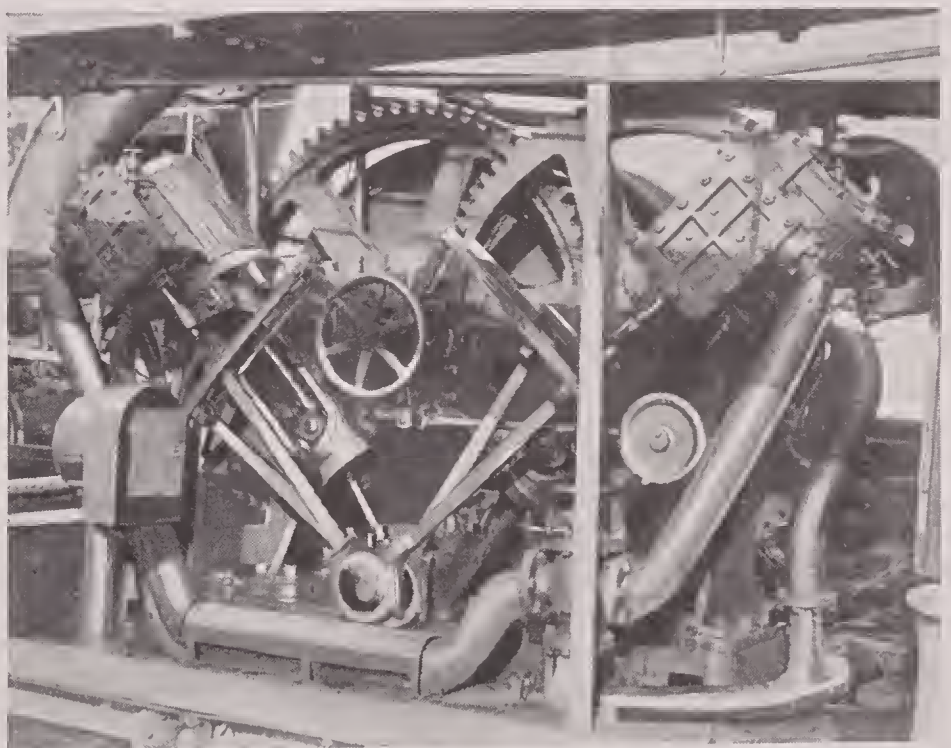
THE FIRST CABLE AND ITS MANY TROUBLES

This is an episode in the brave story of the men whose courage and persistence resulted in the laying of the first transatlantic cable. The cable broke repeatedly, but finally that famous ship "Great Eastern" accomplished the feat of binding together the Old World and the New. This picture shows the scene where the cable that had been lost the year before was fished up and a new section spliced in.

posed of several strands of steel wire. In the deep sea less protection is necessary, and the weight of the cable runs from a ton to a ton and a half a mile. In shallow water the cable must be more heavily armored to protect it from rocks and dragging anchors, so the weight increases to 10 to 30 tons a mile. One of the most difficult problems which faced the early cable builders was to make the cable strong enough to bear this tremendous weight as it was being lowered sometimes more than two miles to its bed; and time after time they were baffled by breaks in mid-ocean.

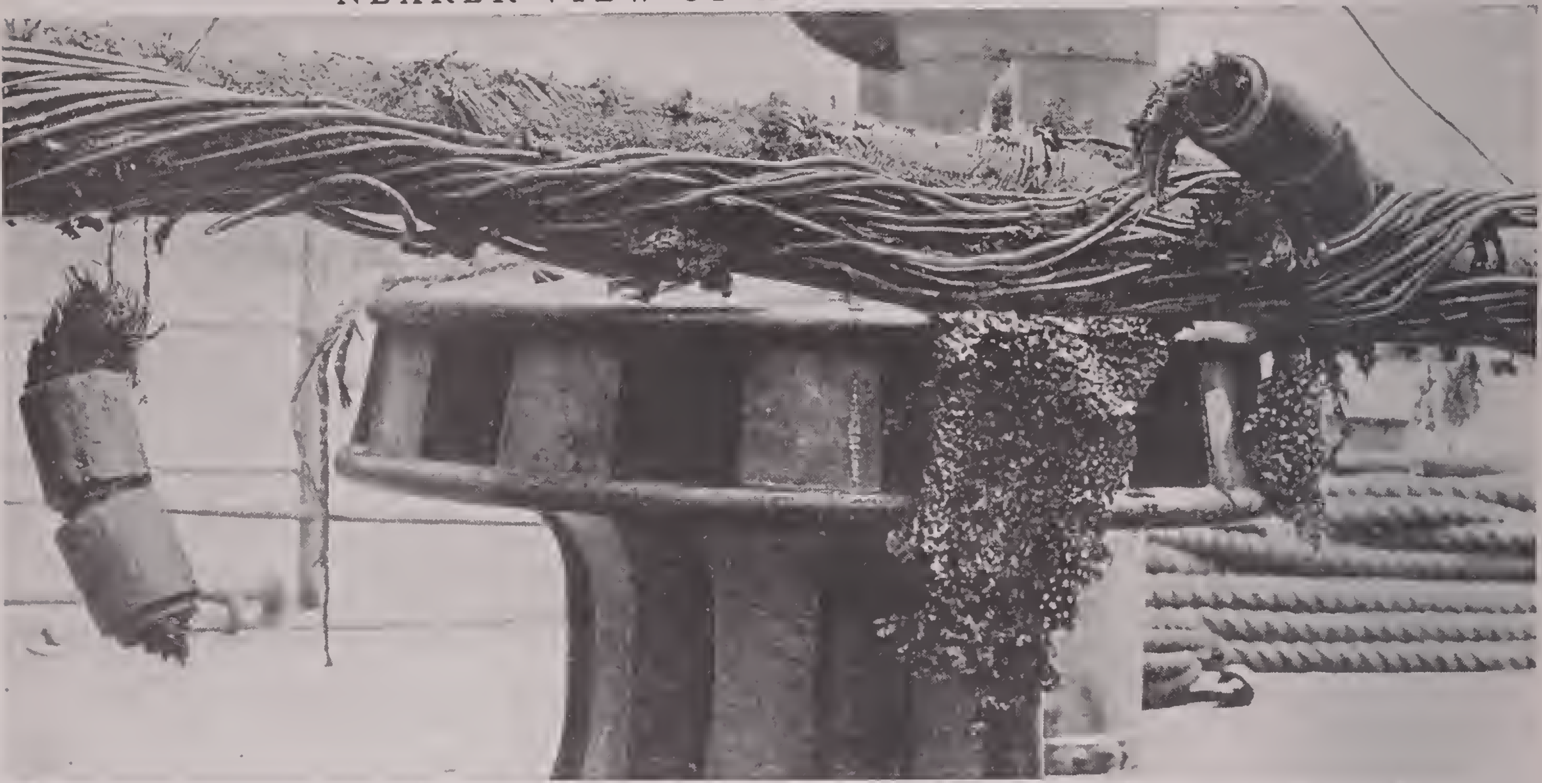
When a current is transmitted over 2,000 or 3,000 miles of cable, much of the initial strength of the current is exhausted by the resistance of the wire and the tendency of the gutta-percha insulation to retain a part of the charge. Hence it has been necessary to devise wonderfully delicate instruments, which will respond to much feebler currents than those used on land systems. William Thomson, one of the greatest scientists of his time, who was later raised to the British peerage as Lord Kelvin in recognition of his wonderful services to science, invented a receiving instrument so delicate that it received a message sent on a battery in a lady's thimble across the ocean through one cable and back through another. His first instrument was a galvanometer in which a tiny mirror was moved from side to side, just as the magnetic needle of the ordinary galvanometer is moved, by changing the direction of the current

THE MACHINERY THAT HELPS LAY THE CABLE



When a cable is being laid, it is fed out from a big spool which is unwound as the vessel speeds along, the unwinding power being supplied by these steam cylinders. The framework holding the spool is turned by means of those big cog wheels.

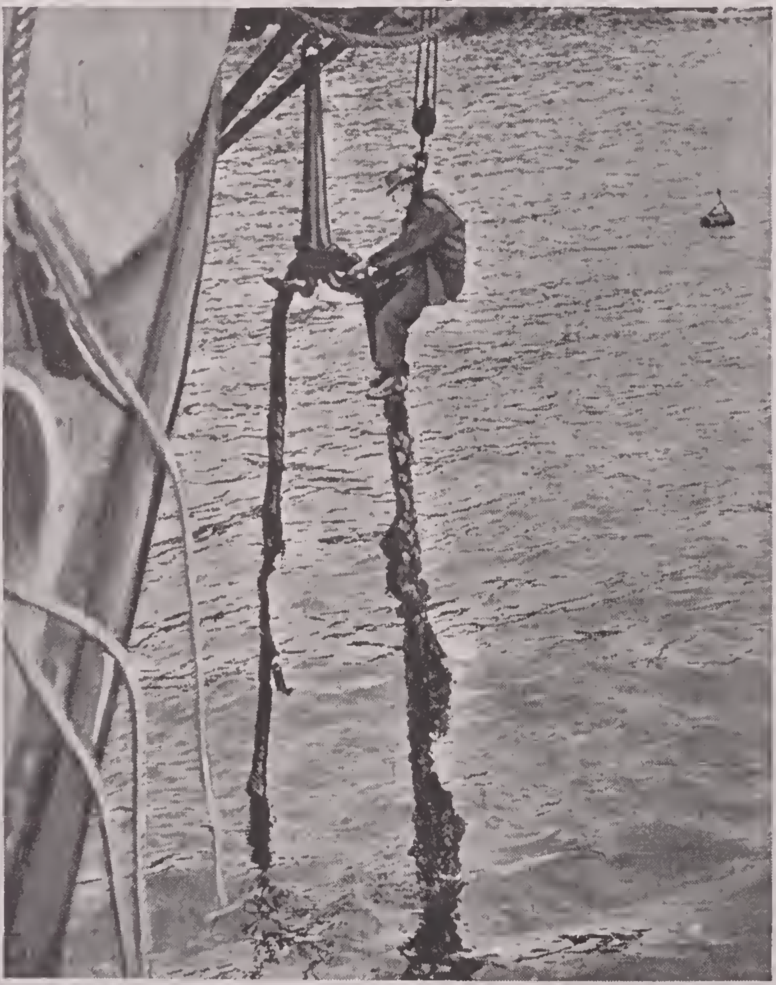
NEARER VIEW OF A DAMAGED CABLE



Here we get a “close-up” view of a damaged cable, broken and battered and covered with seaweed. Contrast the tangled coils with the neat, firm wrapping of the new cable shown in a previous picture. It looks almost as bad as a skein of yarn after a kitten has been playing with it.

passing over the circuit (*see* Electricity). A beam of light was directed upon the mirror so that the mirror’s slightest movement was indicated on a large scale by the movement of the reflected beam of light on a screen placed in front of the mirror. This mirror galvanometer was used in cabling until Lord Kelvin invented a recording instrument, in which a peculiar pen, called the “siphon pen,” was used. A pen actually tracing on paper would be too heavy to be moved by the feeble currents, so Lord Kelvin used a pen so constructed that ink siphoned from an ink well is thrown in a tiny jet upon a paper moved regularly by clockwork. The dots of ink trace out a path to the right or left, representing the dots and dashes respectively of the telegraph code (*see* Telegraph).

FISHING UP AN INJURED CABLE

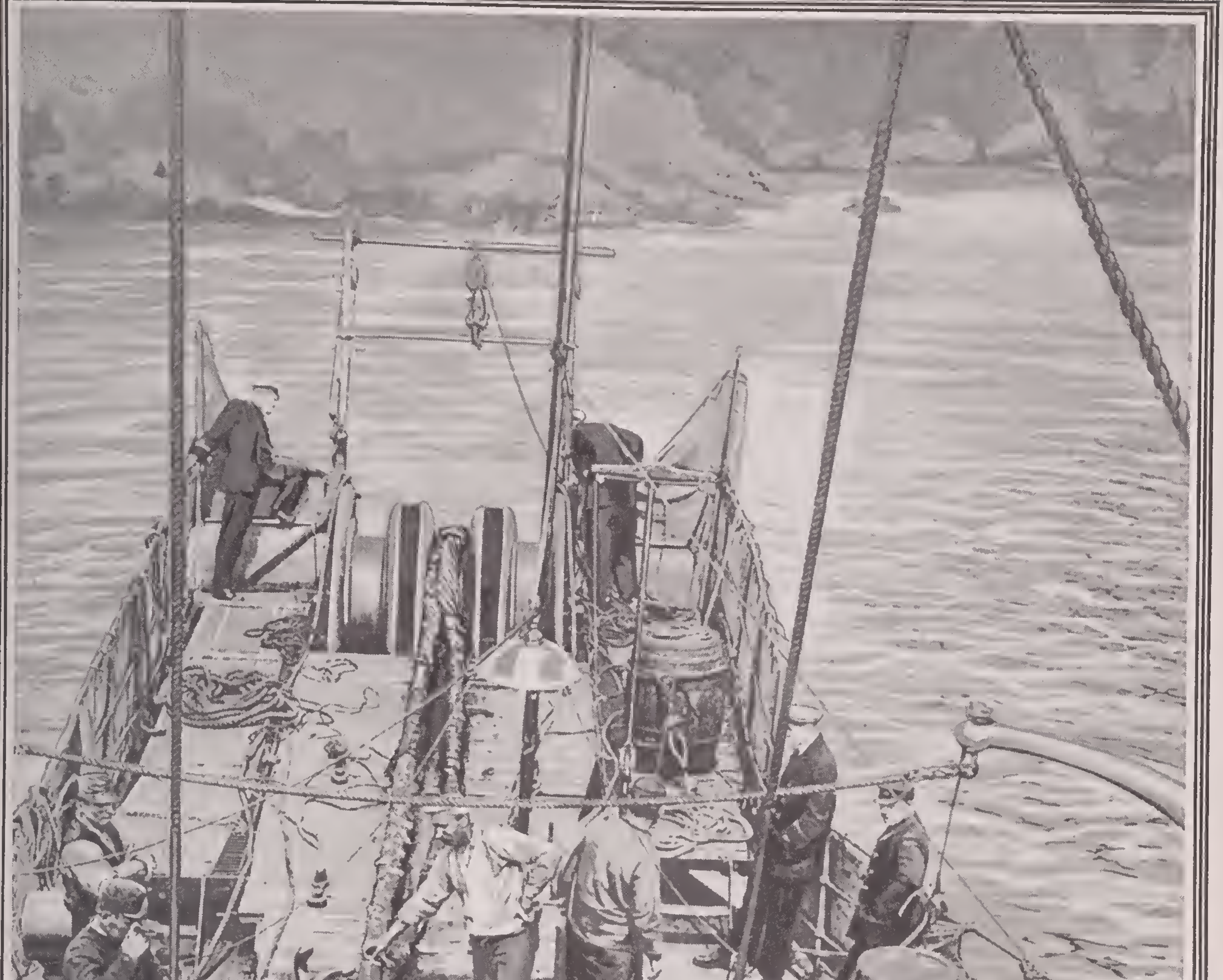


When they have to go out and fish up a cable to see what is the matter with it, this is how they do it, dragging it up with the grappling hooks and then lowering a man to lash it more firmly before it is brought on board.

Just as in the case of telegraphing on land, automatic instruments have been devised to increase the speed and accuracy of sending, and the “duplex” system has made it possible to send two messages at once, one from each end of the line. It has not been found practical to send four or more messages at once, as in land telegraphy, but the use of automatic transmitters with the duplex system increases the total number of words passing over the line in both directions to 80 or 90 a minute. Recently a complicated and delicate instrument has been perfected for use as an automatic relay, that is, to repeat messages automatically with the added strength of a local battery between different sections of a cable touching one or more stations along the way. In the case of the Pacific Ocean cables the stations are on islands in mid-ocean.

Attempts to telegraph under water for short distances had been made even before the first land telegraph was built for general use in 1844, and Morse, the inventor of the telegraph (*see* Morse,

AN INJURED CABLE BROUGHT ON BOARD



Taking on board an injured cable and doctoring it is a process almost as elaborate as laying it down in the ocean bed in the first place. The cable is passed over a drum such as you see here at each end of the ship. Then the ship moves forward slowly and the cable passes by, section by section. When there is mending to do, the vessel stops and the crew sets to work patching and winding until it is as good as new.

WHERE THE CABLE COMES TO LAND

After a cable has been laid along the ocean bed, the shore end must be supported on the surface until it has been connected with the telegraphic instruments in the cable station. This picture shows the land end of one of the great cables at Havana. The cable will be supported on those floating buoys until it has been properly fitted into the trench through which it travels on land.

Samuel F. B.), had predicted that Europe and America would one day be connected by telegraph. Nearly 25 years passed, however, before Morse's prediction was fulfilled. In 1851 a cable was laid between Dover and Calais, and within the next few years several short lines were in operation connecting various parts of the continent and England. The longest line was only 117 miles, so when Cyrus W. Field, an American capitalist, proposed to lay a cable from America to Ireland, a distance of nearly 2,000 miles, the project was generally received with skepticism and ridicule. One distinguished English scientist announced to the world that "it was a mathematical impossibility to submerge a cable in safety at so great a depth," and that "if it were possible, no signals could be transmitted through so great a length." But Field was undaunted by such croakings, and he formed a company which in 1856 laid a cable, 85 miles long, connecting St. Johns, Newfoundland, with Cape Breton, Canada, thus forming the first link in a transatlantic line.

Field then formed a company in England to provide the $1,500,000 necessary for the rest of the enterprise. Foremost of his associates were Sir Charles Bright and Lord Kelvin. A cable was prepared containing 340,500 miles of copper and iron wire woven into strands—more than enough to reach to the moon. Two ships, the *Niagara* and the *Agamemnon*, were loaned by the United States and English governments, and the great enterprise was launched in 1857—the same year that saw the first telegraph line completed across the American continent. The start was made with ceremony from the coast of Ireland, but the cable broke when only 400 miles out.

Four Failures in Succession

Field and Bright were not discouraged, and they made a second attempt the following year. The same two ships met in mid-ocean, each carrying a part of the heavy cable. The two sections were spliced together, and the ships steamed away toward the opposite shores, each unreeling its part of the cable. Three times the cable parted after a number of miles had been covered, and three times it was spliced anew, but all in vain. After a fourth break the effort had to be abandoned.

A storm of ridicule broke on the luckless promoters, and they had great difficulty in getting the money to re-equip the ships. But the money was raised, and a year later the ships once more met in mid-ocean, again spliced their cables, and proceeded cautiously on their way. Ships passed too near for the safety of the sinking cable, and floating icebergs and the antics of a whale nearby gave rise to much fear and anxiety; but at last, on Aug. 5, 1858, each ship reached its harbor with the 2,000 miles of precious cable still intact and with telegraph signals still passing through it. The rejoicing was general on both sides of the water. Queen Victoria and President Buchanan exchanged congratulatory cable messages, because of the new bond of union between the two countries; and the men who had persevered in the face of such obstacles were publicly honored. Less than three months later, however, the messages grew gradually feebler and finally ceased. The wires had been burned out by the use of too strong currents, and the whole gigantic task had to be begun anew.

Field and Bright were still undaunted, but public confidence was gone. The breaking out of the Civil War in America contributed to prevent further attempts for seven years. Meanwhile Lord Kelvin had perfected his delicate receiving instrument, and Field was tireless in his attempts to raise new capital. Though he was desperately seasick whenever he went to sea, Field crossed the Atlantic 64 times to promote this enterprise.

At last, in 1865, Field and Lord Kelvin loaded a new cable on the *Great Eastern*, the largest ship then afloat. When half the journey had been made the cable parted and sank. The next year saw the same two men once more on the giant ship, laying a new cable. This time success at last crowned their efforts. The ship then turned about, and with improved grappling tackle succeeded in raising the cable that had been lost the year before. A new section was spliced on and the ship returned to shore, completing the second cable between Europe and America. Improvement in the making and laying of cables continued, and other cables were soon in operation.

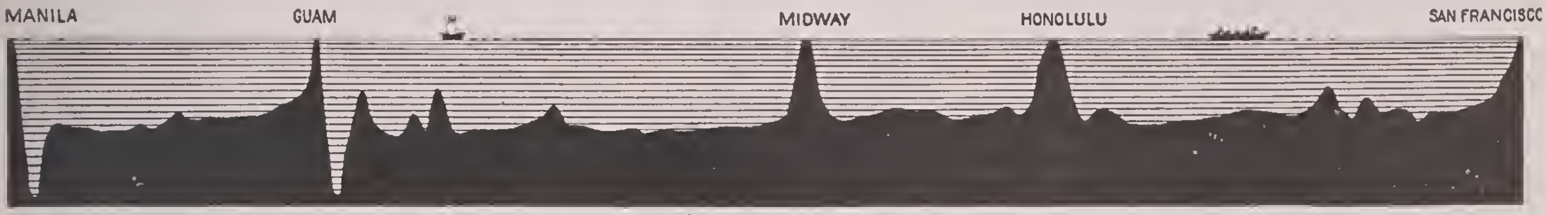
A Ready-made Bed for Cables

Fifteen cables now span the Atlantic, nine of them in working condition. Most of these stretch along the same high plateau of the ocean bed where the first cable was laid. This is called the "Telegraph Plateau" because it is comparatively level, with a greatest depth of about two miles, and is covered with a soft ooze favorable to the successful laying of cables.

The task of laying these cables would have been immensely more difficult if the existence of this plateau had not been known, making it possible to use a much shorter and lighter cable than would be necessary to stretch over the alp-like surface of other parts of the ocean bed. Matthew Fontaine Maury and other naval officers of the United States and England discovered this plateau by their patient labors in charting the ocean bottom, and thus deserve a place among the men whose labors have made the transatlantic cable a success.

Cable laying in the Pacific is much more difficult than in the Atlantic because of the greater distance and greater depth. The first Pacific cable was laid in 1902, connecting Vancouver, Canada, with Australia and New Zealand. It is about 8,000 miles long, and one span from Vancouver to Fanning Island is 3,600 miles, making it the longest continuous section of cable in the world. The other Pacific cable was completed the following year, from San Francisco to Manila, at a cost of $12,000,000. It touches at Honolulu, Midway Islands, and Guam, and has been extended to Japan. These wonderful cables cross mountains and valleys of the ocean bed, and in some places they lie six miles beneath the ocean surface.

THE ROUGH ROAD THAT CABLES HAVE TO TRAVEL



A view through the sea from San Francisco to Manila would look something like this; for the sea bottom, like the land, has its mountain peaks and its yawning chasms. The cable is strung between the highest peaks, which are islands, and loops down to the ocean floor between them.

Cable tolls are necessarily expensive, as a result of such costly equipment; but the tariff for messages from New York to London has been as low as 12½ cents a word, compared with the charge of $5 a word in the early days. All persons or firms who habitually employ the cable use codes in which one word does the duty of 10 or 15. Newspaper messages are "skeletonized," that is, cut down by the omission of all but the most important words.

In time of war international law sanctions the cutting of cable lines to the enemy's territory. So, during the World War of 1914–18, all of the Atlantic cables to Germany were put out of service by the Allies.

CAB'OT, JOHN (1450–1498). One fine May morning in 1497 there sailed from the harbor of Bristol, England, a tiny little ship with a crew of 18 men. The ship was not much larger than one of our fishing boats, but it was setting out on one of the most momentous voyages in the history of the world. The captain was John Cabot, an Italian born in Columbus' own city of Genoa; but he was sailing under the flag of the king of England, to make a voyage of discovery to the strange New World which Columbus had reached five years before. Henry VII of England had most unwisely refused to help Columbus when he was trying to fit out his expedition, and so now he was delighted to give his permission for Cabot's voyage.

Boldly Cabot steered his little ship northwestward across the boisterous Atlantic. On June 24, 1497, after several weeks of peril and hardship he sighted the coast of North America—the first European to reach the shores of that continent, since the days of the old Northmen. The land he discovered was probably Cape Breton Island and the nearby island we call "New-found-land." When Cabot returned with the news of his eventful discovery, the king, being a miserly sovereign, gave him only ten pounds as a reward, but made up for this niggardliness by raising Cabot to the post of admiral.

The next year Cabot set out on a second voyage with two ships and 300 men, and apparently discovered the barren shores of Labrador and sailed as far south as Maryland before returning to England. Soon after returning to England John Cabot died. The importance of his discoveries became evident later, when England laid claim to the whole of North America on the ground that Cabot was the first discoverer to reach the mainland.

John Cabot's son Sebastian (1476–1557) is thought by some to have accompanied his father on these expeditions. At all events he became a renowned map-maker and navigator and commanded a Spanish expedition to South America in 1526, which explored the region around the La Plata, Parana, and Paraguay rivers. Later he returned to the employ of the English sovereigns, for whom he tried to find a passage to Asia by the northeast route (north of Asia), and thus did much to open up trade between England and the land later called Russia.

CACAO. This valuable tree, native to the tropical parts of the American continents, produces the seeds from which the world's supply of chocolate and cocoa is made. It is an evergreen, ever-blooming tree ranging from 20 to 40 feet in height, with a straight branching stem. The leaves are large, oval, and glossy, dark green above and red below. The flowers and fruit grow in a peculiar position, springing in numerous clusters directly from the trunk and older branches. The fruit is a pod about the size of a small cucumber, green at first and purplish-yellow when ripe. It grows on a stem so short that it looks as if it were artificially attached to the tree. The hard leathery rind, about half an inch thick, contains five or eight rows of white or pale purple beans—from 29 to 50 altogether—imbedded in a sweet pink pulp. These beans are the raw material of chocolate and cocoa (*see* Chocolate).

The cacao tree is extensively cultivated in Mexico, Ecuador, Venezuela, Brazil, Cuba, Porto Rico, Haiti, San Domingo, Trinidad, Jamaica, Gold Coast of Africa, Portuguese East Africa, and Ceylon. The plants are grown in nurseries and come into bearing when they are about five years old. Scientific name, *Theobroma cacao*.

CACTUS. The most precious thing in the desert is water, and each desert species of animal or plant has through ages worked out its own answer to the question, "How can I live with so little to drink?"

THE GIANT CACTUS

Don't you think it's well named—the Giant Cactus? This queer looking plant is a natural water reservoir. That's how it manages to live in the deserts of Arizona.

The cactus' answer to this question is very interesting. Leaves on plants which grow under ordinary conditions are very wasteful of water, taking it up from the sap and giving it out to the air in a process called transpiration. To avoid this waste of water, the cactus has given up having leaves, and has its stems of such form as to expose as little surface as possible to the direct rays of the sun which act to make the plant give up its moisture. Also the stems are thick so as to give room for storage of the precious water and protected with thick covering to keep it safely hoarded.

There are many forms of *cacti* (as the plural is written) in the United States. The most impressive is the "giant cactus" of Arizona belonging to the genus *Cereus*. Its stems and branches are like huge spiny columns from one to two feet thick. It often grows 40 or 50 feet high and looks like a giant candlestick. This cactus has long, tubular, very showy flowers. The fruit is egg-shaped and has a crimson pulp which the Indians use for food; they gather it with a forked stick attached to a long pole. Woodpeckers find the big stems of this cactus a favorable place for digging out their nests.

Some cacti are in the form of very spiny globes. Those with flat stems belong to the genus *Opuntia*, a good example of which is the common "prickly pear." Of these there are many species, but they are all alike in having their stems and branches in roundish flattened sections and jointed. They have small fleshy leaves which fall off, and at the base of each is left a tuft of cruel spines of two sorts, meant for the punishment of any thirsty trespasser. The prickly pear has yellow or reddish showy flowers, and a pear-shaped fruit which is delicious and satisfying to thirst. Certain species of *Opuntia*, which were introduced into Australia as a pretty flowering hedge, have run wild and become "the world's greatest vegetable terror," spreading their vicious thorny plants over miles and miles of valuable grazing and farming lands.

Cacti are found native chiefly in the arid regions of America—in Arizona, New Mexico, Central America, and extending to southern South America. About 1,000 species have been named, varying greatly in form and size. Many curious and beautiful varieties are prized as hothouse plants, among them the "night-blooming cereus," whose lovely waxlike blossoms open in a single night and wither at the approach of sunlight.

From the juicy stems of the cactus primitive peoples long ago learned to distil both medicines and intoxicating drinks. It was long known that were it not for the prickly spines the cactus would furnish excellent fodder for cattle, and Luther Burbank spent many years in experimentation to produce a spineless cactus.

Scientific name of giant cactus, *Cereus giganteus;* a common species of edible prickly pear is the *Opuntia engelmanni;* the globe cactus is *Echinocactus horizonthalonius.*

CAD'MUS. Once upon a time Zeus, the chief of the Greek gods, took upon himself the shape of a bull and carried off the maiden Europa, from whom, according to the story, the continent of Europe was named. Her brother Cadmus, together with his mother and brothers, were sent to recover her. After a long vain search, Cadmus, weary of the hopeless task of outwitting Zeus, consulted the Delphic oracle, who told him to give up his quest, follow a cow which he should meet, and when she lay down, to take that spot for the site of a city.

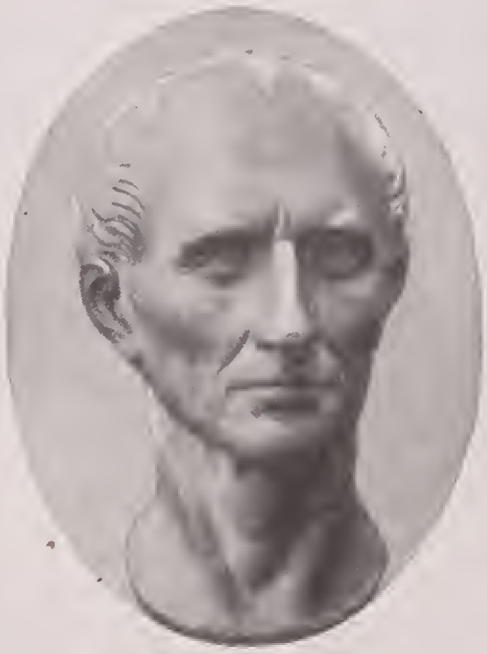
As the oracle prophesied, Cadmus met the cow and followed her to Boeotia. When the cow lay down to rest, Cadmus sent his followers to a spring to bring water, for he intended to sacrifice the cow to the gods and needed water for the sacrifice. A dragon, sacred to Ares (Mars), lay in hiding near the spring, and killed Cadmus' comrades. Quickly Cadmus rushed upon the dragon and slew it. Then the goddess Athena (Minerva) appeared and ordered him to sow the dragon's teeth like seed in the ground. Cadmus obeyed, and immediately there sprang up armed men who fought among themselves until only five remained. These became Cadmus' subjects, and helped him to build the citadel of his new city, Thebes. A later legend says that Cadmus brought the Phoenician alphabet into Greece and so became "the father of letters."

CAEDMON (*kăd'mŏn*) (died 680 A.D.). The earliest English Christian poet, Caedmon, lived and sang at a time when the language was called Anglo-Saxon and was very different from the English of today. It is said that he was an uneducated cowherd and that once there appeared to him in sleep one who said to him: "Caedmon, sing me some song." "I cannot sing," was the answer. "But you shall sing to me." "What," asked Caedmon, "shall I sing?" "Sing the beginning of created things."

In the morning Caedmon told his dream to the abbess of Whitby, and he put into verse for her a part of the Scriptures. In recognition of his genius, he was made an inmate of the monastery and educated, and he spent the remainder of his life writing poems called 'Paraphrases' on the Bible histories and on other religious subjects.

ROME'S GREAT GENERAL, *Who "Came, Saw, Conquered"*

CAESAR, CAIUS JULIUS (102–44 B.C.). Though the daggers of the assassins brought the career of Julius Caesar to an untimely end and left his life-work unfinished, he stands as one of the few men who have changed the history of the world. A soldier of unsurpassed ability, a scholar and writer of the first rank, and a statesman of prodigious insight, Caesar was the greatest genius Rome ever produced. Amid the chaos of a powerless and outworn system of government, he laid the foundations of a new order on which was to arise the greatest of all ancient empires and preserved the civilization which has become our own inheritance today.



JULIUS CAESAR
Soldier, Scholar, Statesman

When Caesar was a young man he was captured by pirates in the eastern Mediterranean. When they told him he must give them 20 talents for ransom or they would put him to death, he laughingly said:

"What! Only 20 talents? I will give you 50 talents for my life!"

While messengers were gone to Miletus for the money, he joked with his captors and vowed to hang them all some fine day. The pirates were greatly amused at his high spirits. They had no idea that he would come back to carry out his threat. But Caesar was a man of his word, and within a few weeks after his release the whole pirate band was captured and suffered the death they merited.

How Caesar Won the Roman People

Hiding his serious self under this mask of lighthearted gaiety, Caesar made himself a favorite with the people of Rome. When he was overseer of public games (66 B.C.), he increased his popularity by preparing magnificent spectacles in the Great Circus for the pleasure-loving Romans, at the cost of a crushing burden of debt for himself. The dignified Roman senators would have laughed to scorn the suggestion that this careless young fop would some day be the conqueror of the world, the most powerful man in Rome. That there was shrewd purpose under his smiling exterior—that Caesar saw the rottenness of the existing government, the need of a strong central power to save Rome's power from decay, that he felt himself to be the man to bring this change about—no one realized. But such was his aim, and as a part of his plan he formed a political alliance with the two most powerful men in Rome, the wealthy Crassus and the popular general Pompey. Caesar's election as consul in 59 B.C. was the result, and the senators, who were now beginning to be alarmed, were glad to see him sent after his year of office to be proconsul in Gaul, the country we now call France.

Here was Caesar's chance to prepare for the changes in Rome which he knew must come. While in Gaul he built up a well-trained army, subdued all Gaul, put down a dangerous uprising under a leader named Vercingetorix, made a successful invasion across the Rhine, and twice led his army into Britain. He did not conquer any part of Britain, but he paved the way for the Roman occupation of that island a century later. During these years of war and conquest, Caesar not only showed his ability as a great leader and organizer, but endeared himself to his soldiers so that they would follow him anywhere. He worked with them, fought with them, and endured the same hardships. When at one time his soldiers mutinied at the appalling dangers they were called upon to face, Caesar shamed them into obedience by declaring that if all others deserted him, he would go on with the faithful Tenth Legion alone.

Crassus was now dead and Pompey, jealous of the growing power of Caesar, had veered around to the side of the Senate. Caesar was commanded to disband his army, but knowing that this would mean his political ruin he refused. Instead, he led his loyal forces across the little river Rubicon, in northern Italy, which was the southern boundary of his province, and marched against Rome. From this action, which amounted to a declaration of war against the Senate, comes our expression to "cross the Rubicon," meaning to take action which will inevitably bring certain consequences.

During the five years of civil war which followed Caesar's appearance at Rome, he put down rebellions in Spain, decisively defeated Pompey at Pharsalus (in Greece), and was successful in overthrowing his opponents in Egypt, Africa, and Asia Minor. It was from Asia Minor that he sent his famous message to the Senate: "I came, I saw, I conquered."

Caesar was now master of all the Roman world. Recognizing that the old institutions of the republic were outworn and dead in all but name, he sought to build a new and stronger order in which the supreme power should be in the hands of one capable man. He had himself made dictator for life, took the title of "imperator," assumed the powers of all the leading offices of the state, and set on foot many far-reaching reforms. But there were still many of the old oligarchy who could not tolerate the idea of a one-man rule, even though it brought good government, and they plotted to take his life.

The senate was to hold a meeting on March 15 (called by the Romans "the ides of March"), and the plotters determined that the dictator should die on

THE SURRENDER OF VERCINGETORIX

This brave and able Gallic chief was the deadliest foe Rome had met since the days of Hannibal. When Caesar's generalship had made further resistance hopeless, Vercingetorix rode full-armed to Caesar's camp and surrendered himself as a sacrifice for his people. Caesar brought him to Rome to grace his triumph and to suffer death at the foot of the Capitol.

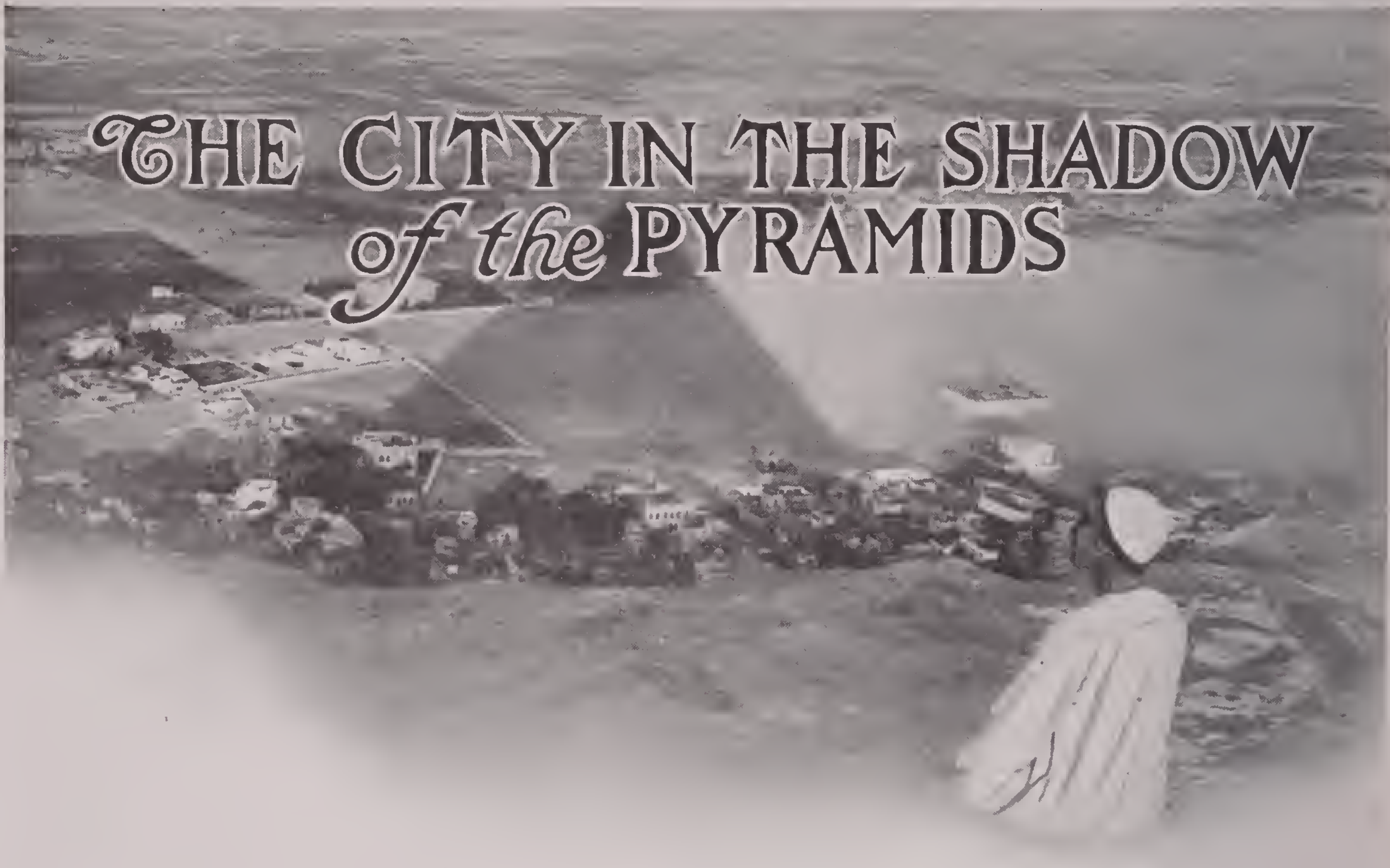
CALPURNIA WARNS CAESAR OF HIS DEATH

The artist has drawn for us a thrilling scene from Shakespeare's play. Pacing with her lord the marble portico of their palace in the middle of the night, Calpurnia, wife of Caesar, is endeavoring to persuade him not to go to the Senate on the morrow, the fateful Ides of March. She tells him of a frightful dream that has just awakened her. "Fierce fiery warriors," she says, "fought upon the clouds, in ranks and squadrons and right forms of war, which drizzled blood upon the capitol." But Caesar disregarded her warning and also that of the soothsayer or priest, and the next day he was murdered.

that day. Among the conspirators was Caesar's friend Marcus Junius Brutus, a Roman of such stern virtue that he was ready to sacrifice his friend and benefactor to what he believed to be the cause of liberty. Caesar was warned by a soothsayer to "beware the Ides of March," and his wife begged him to remain home from the Senate that day; but the conspirators persuaded him to attend the meeting.

No sooner was Caesar in the Senate chamber than he was surrounded by the conspirators. At a signal they drew their daggers and attacked him. At first Caesar defended himself, but when no one came to his assistance, and he saw his friend Brutus with a dagger in his hand, he gave up the struggle, and with the words, "Thou too, Brutus!" (*et tu, Brute!*) he fell at the foot of Pompey's statue. Thus Rome lost her greatest statesman and soldier, while the would-be saviors of the Republic did not accomplish their purpose, for 14 years later Caesar's nephew Augustus became Emperor of Rome. The next four emperors also belonged to the family of the Caesars, and the imperial name thus gained such dignity that it was retained henceforward as a title of honor, surviving to the World War of 1914–18 as the official title (Kaiser) of the German and Austrian rulers.

Julius Caesar left his mark on literature as well as on history. In the midst of his busiest campaigns his unquenchable energy found time to record the events in which he was taking part. His history of the Gallic wars is familiar to every student of Latin, and is usually one of the first books he reads, because of its interest and simplicity of style.



THE CITY IN THE SHADOW of the PYRAMIDS

CAIRO (kī′rō), Egypt. In the 4,000 years of ancient Egypt, and in the Hellenistic and Roman days, there was no Cairo. Yet this city, which was born only after Christianity had been in existence almost a thousand years, is today the largest city in Africa and second only to Constantinople in the country about the eastern Mediterranean.

At the time of the Arab conquest of Egypt, in the 7th century A.D., the victorious general of Omar, the second caliph, cried out as he entered Alexandria: "Behold a city made ready for us!" But his master asked, "Will there be water between me and the army of the Muslims?" And when the answer was "Yes, O Commander of the Faithful; there will be the Nile," the general was bidden to choose another site for his capital, lest the inundations of that great river should cut off communications with Arabia, the center of Mohammedan power. He selected a site on the east bank of the river, 130 miles southeast of Alexandria, and there he founded El-Fostat which later was called Old Cairo.

This little boy is carrying Nile water in a goatskin and sells it to Egyptian housekeepers for cooking and drinking.

Then, in the course of civil wars among the Mohammedans, the Fatimite dynasty conquered Egypt, and El-Fostat was pillaged and destroyed. So in 968 a new capital was laid out, a little to the north, called El-Kahira ("the victorious"), a name since corrupted into "Cairo." Thus was founded the city famed in the 'Arabian Nights', destined to be throughout the later Middle Ages the center of trade between Europe and the East, and a seat of Mohammedan learning.

From the height of the citadel—built by the great Saracen leader Saladin, in the 12th century—we may look down upon Cairo's ancient walls and lofty towers. We behold its many famous mosques, with their delicately carved domes and fantastic minarets; and in their midst we see the great Mohammedan university of nearly 8,000 students, founded in 971. The winding streets of the oriental quarter are filled with high narrow houses with projecting upper stories, from which jut latticework windows, like elaborate birdcages, that almost meet across the narrow ways. In the busy bazaars merchants sit cross-legged before their shop fronts, selling their wares to the everchanging and many-colored throng of passers-by. And beyond this picture of the East we see the European quarter, lying along the broad island-studded Nile; while to the north—ten miles distant—towers the

Great Pyramid against the horizon, and to the east the peaks of barren cliffs outline sharply the brown sand wastes of the desert. Population, about 800,000.

Cairo was taken by the Turks in 1517. In 1798 it was captured by the French, from whom it passed again under Turkish rule. It is now the head of the British protectorate in Egypt, as well as the capital of the Sultan. The inhabitants are of many races—Arabs, Turks, Greeks, Italians, British, French, Copts, Jews, etc. In medieval times great gates, which were closed at night, separated the different quarters.

The commerce of Cairo is extensive. Gum, ivory, hides, and ostrich feathers from the Sudan, cotton and sugar from upper Egypt, indigo and shawls from India and Persia, sheep and tobacco from Asiatic Turkey, and a great variety of European products pass through the city. Its chief manufactures are cotton goods and paper.

Cairo is the northern terminus of the Cape-to-Cairo Railway, that gigantic project of Cecil Rhodes for crossing Africa from north to south with perhaps the longest railway in the world. The rail line crossing the Suez Canal at Kantara goes to Jerusalem in Palestine.

Modern Cairo and Ancient Egypt

NOTHING that the traveler has ever seen is quite like Cairo—if he has never been to India or Damascus or Constantinople. The color of Cairo is something the traveler never forgets, with its panorama of human life which never ends; the tens of thousands, hundreds of thousands, of lives which nothing seems ever to perturb; the glow of the city in the sun from the height of the citadel, with its miles of domes and minarets; the population moving like ants on a hillside, with the river which brings life to Egypt winding in the background; and far beyond, ten miles or more from where he stands, the Pyramids and the desert. One wonders if there are six scenes in the world so vast, so solemn, so thrilling, as this city on the edge of the desert, in the glare of the noonday sun.

A Many-Colored "Movie" of the Changeless East

Cairo itself is wonderful. Only a great artist could hope to give some suggestion of its color and its humanity. Was ever such a blending of color, or such a mixture of peoples, or such a living picture of the Old World? You are not surprised to be told that in those bulrushes Pharaoh's daughter found Moses; your surprise is that Moses is not there! You wonder if that group of Bedouin Arabs in the desert are Joseph's brethren; for all the change that has taken place they well might be.

Hawks fly past you as you walk in the street, buffaloes draw carts and plows, white donkeys and black ones bear half the burdens of the town, boys and girls in flowing robes build houses instead of learning alphabets. The faithful Mohammedan prays in the fields; the unfaithful cries "Baksheesh!"—asking a gift as you pass. The women hide their faces behind thick and ghastly veils; the children alone seem even as you and I.

The Egyptian Idea of Department Stores

Who can describe these wonderful bazaars, with their thousands of sellers and seemingly no buyers; packed with everything in the world that nobody wants; with the most appalling things to eat and the richest things to wear; with the gaudiest and most miserable jewels; with shoemakers, polishers, tailors, jewelers, coffee-grinders, and a host of busy folk working in the doorways or in the open fronts of shops; with every kind of work going on before your eyes; with the filthiest hovels on earth packed with gorgeous color? Who has ever seen, anywhere, such splendid rubbish-heaps?

The houses of this motley multitude—do they reach to the sky? And the pavements—are they the factories of Egypt? At every turn some little group is busy roasting chestnuts on the curbstones, even at midnight; making coffee for passers-by; displaying

PART OF CAIRO'S TRANSPORTATION SYSTEM

Cairo has a modern street car system, but primitive vehicles like this are still in use. They are well patronized because the fare is low—only one cent. A man wouldn't be allowed to ride on the cart you see here, as the Mohammedan religion doesn't permit strange men to sit beside women. Even the electric street cars are divided into compartments that separate the sexes.

their rings of bread and plates of strange confections on the dirty ground.

See the white donkeys with their blue necklaces, the crowds of cows and buffaloes and camels in the road; hear the cackling hens in the shops, the stray sheep and goats in the busy streets. Hear the moaning of the carpet-man, the solemn dirge of the prayerful man. Feel the misery of these happy people. Smell their streets and shops. Escape, if you can, from the heap of fish in that window, from the basket of onions in this, from the carcass in that butcher's shop. Turn the corner and see their tobacco shops, the daintiest imaginable. Step inside their mosques; put your feet into their yellow sandals — and see the glory of Cairo, the wonderful, unmatched, and unforgetable panorama of a hundred square miles of domes and minarets sparkling in the sun!

See Father Nile flowing, as he has flowed ten thousand years, still bearing prehistoric craft past great palaces and banks lined with palms; with the dim background of the distant desert rising against the sky, the great Pyramids of Gizeh, ten miles distant, plainly seen, and those of Sakkara, more distant still, looming beyond.

Stand here on the citadel and watch the sunset over it all, and remember that the sun has set over it for more centuries than you can count years—unless you are getting old; that in the plain before you empires have been born, empires have been lost!

People the arena with the great immortals—Julius Caesar, Mark Anthony, Cleopatra, Moses, and the Pharaohs; and then—then walk slowly down the hill, see the human relics of this past greatness, and wonder what life and the world mean. Take a carriage at the bottom, and drive ten miles. Three miles bring you to an avenue lined with trees—"the avenue that never ends"—and about you are oranges, bananas, and dates in the gardens, and buffaloes at work in the fields, led by men in long blue robes.

But let them pass. Ahead, just in front of you, at the bottom of the way, stand the Pyramids. A mile goes past, and then another, and another. Still more miles pass, and more—and still, in front of you, these great things rise. Rub your eyes and be sure you do not dream. Then at last the desert, the greatest structures that were ever built in stone, and the strange ugly Sphinx!

A CANDY MAN IN CAIRO

One thing about the Egyptians—about all Orientals—that will make a special appeal to our younger readers, is that they are very fond of candy, grown people as well as children. Here is a portable candy shop in Cairo.

We are at the Pyramids, the most famous spot for travelers on all the earth, and we watch the shadow of the Great Pyramid—greatest of the three—creep along the sand. As we sit in the sand, looking at this huge thing, with neither beauty nor usefulness to plead for it, it is hard to think what we shall say about it. The sun shines down on it today as it shone on it when Abraham and Moses looked at it, and a thousand years before. The moon looks down on it tonight as on that night when a mother brought her Child down into Egypt to flee from the cruelty of Herod.

The Great Pyramid is the greatest monument ever set up on the earth, and the only monument on the face of the earth which looks today, at any rate from a distance, almost exactly as it must have looked 6,000 years ago. It is less useful in the world than a pin; it has no inspiration to give us; it is simply the most terrible heap of stones that has ever been piled up by human hands. And yet we sit in the sand and gaze at it with wonder, for it speaks of a time that can never come again in the world, of a time when a man could chain a hundred thousand men and drive them to labor like beasts of the field.

For 20 years a hundred thousand slaves worked to build this single pyramid, the greatest of the three that rise from the sand near Cairo; and they made this pyramid, which was merely to hold the dead body of a king, nearly three times as big as St. Peter's in Rome, and 50 feet higher. Its foundations are set in 13 acres of sand, and the stone it contains is nearly 90,000,000 cubic feet, or enough to make a narrow pathway, a foot wide, two-thirds of the distance round the earth!

A few miles across the sand lies Cairo, and through Cairo runs the Nile. Six hundred miles up the Nile is the great Assuan Dam, over a mile long, 90 feet thick at the bottom, 90 feet high, and 20 feet thick at the top; and this huge Nile dam, holding up enough water to make the desert of Egypt blossom as the rose, has just about a quarter of the quantity of stone that is piled up in this great pyramid! Somebody has reckoned that if the pyramid could be made to slide on its base it would need a hundred million men to drag it along.

Inside this monstrous thing lies the tomb of the builder of it; so useless is this massive monument—as useless as the ugly Sphinx near by. It is not these things that stir the traveler who sees Egypt for the first time. It is when he takes the train from Cairo at half-past six in the evening, and steps out of it at Luxor, 400 miles to the south, at half-past eight next morning, that the traveler really feels that he is in another world.

The Dead Empire Buried under the Sands of Time

Under his feet lies ancient Thebes, buried beneath mud huts and desert sands. The thud of a hundred axes, the tread of camels with their burden of earth, the incessant plodding of an army of excavators digging up spadefuls of history, come to him like an echo from the lost city that was once the capital of an empire. Before him rise the impressive columns of the temples of Luxor, from which, 3,000 years ago, an avenue of sphinxes over a mile long led to the great temple of Karnak. He flings his guide-book down as he gazes on these vast remnants of an empire which was great before Greece and Rome were born. It is nothing that this courtyard is 400 feet long, that those columns weigh a hundred tons each. It is everything that here sat Rameses II, that here came Alexander, that here was the heart of the world in an age of which his mind cannot even think, that the stones rising to the sky from his feet were placed there by the greatest builders that the world has ever known, thousands of years before the church of St. Paul was set up at the top of Ludgate Hill in London!

Who shall describe the glory of the Tombs of the Kings? Surely nowhere in the world is the sublime so near to the ridiculous as these mountain tombs of Thebes to the donkey-boys who walk to them daily and see no marvel there.

"They think we are mad," said one who knows them well, when I asked him what the donkey-boys think of American excavators and travelers at Thebes. "They would sell us any fragment of any tomb, any carving from any wall, any head of any figure, any scarab or mummy or vase 50 centuries old, for five piasters (about 25 cents), or, if we protested that it was too dear, for three. And yet these tombs are like nothing else in the whole earth. The Pyramids are ordinary, Westminster Abbey is a

THE GREAT UNIVERSITY OF MOHAMMEDANISM

Thousands of students from all parts of the Mohammedan world spend three or four years studying in the great university of their faith, the Azhar Mosque at Cairo. Professors and students sit on the bare pavement of this great sunny court, or other parts of the sanctuary, where all the teaching is done. If the pupil is lucky he also gets a sleeping place in the mosque. The chief studies are the Koran, Arabic grammar, theology, law, medicine, rhetoric, and logic.

FROM CAIRO TO THE PYRAMIDS

A five-mile avenue bordered with acacia trees leads from Cairo to the three famous pyramids of Gizeh. These pyramids, situated on the borders of the desert, are plainly visible from the city. The first is the "Great Pyramid" of Cheops or Khufu; the second is the pyramid of Khefren, and the third and smallest is the pyramid of Mycerinus. They have stood in this spot more than 4,500 years.

child's toy, compared with these amazing chambers of the dead."

In the Valley of the Tombs

Crossing the Nile from Luxor, an hour's ride in the desert reveals the valley of the tombs. For hours, for days, perhaps, we may ride over them and not take the same road twice. From their heights we look down on the great statues of Amenhetep; the Rameses urn, with the statue of Rameses weighing a thousand tons; the beautiful temple of Medinet Abou; Luxor; Karnak itself—all seen in miniature as though through the wrong end of a telescope. Deep down in the heart of these mountains, in spacious chambers fit for kings to live in, the kings of Egypt lay in their coffins.

Think of the most impressive place where all that remains of a king of men can be laid—of the heart of Livingstone, in the heart of his own Africa; of Cheops, in the terrible loneliness of his great Pyramid; of Cecil Rhodes, at the summit of the mountain from which he looks down upon a continent; of Mohammed at Medina; of Washington, of Napoleon, of Nelson, of Wellington, under the very pavements of their country's capitals!

And none of these resting-places of immortal men can be likened, for an impressiveness that is thrilling and overwhelming, for a great silence that can be felt, for an imagination that has in it poetry and music and terror and prayer and strength and wonder, to the graves of the dead kings of Egypt, opened up for us to see by the enthusiasm of philanthropy and love of knowledge of an American citizen, Mr. Theodore M. Davis.

Hundreds of feet deep in the mountains, through chambers cut in the solid rock, within sculptured walls bearing the history of their lives, as rich in color as if the paint had dried upon them yesterday, Amenophis II lies in his coffin as his people left him there 3,000 years ago. In a smaller chamber, among the dust on the ground, lies a beautiful woman, her black hair falling over her shoulders, who played, we are sure, with the princes in the king's palace 1,500 years before Jesus Christ was born. And as we gaze upon her face, forgetting that thousands of years have passed, we wait for her to turn in her sleep and kiss the boy who lies beside her.

So it is everywhere in Egypt—wonder piled on wonder, age-old ruin and age-old splendor at our feet! The whole wide world has nothing to compare with this strip of fertile earth that runs along the Nile.

Calais (*kä-lā′*), **France.** This seaport of France, on the Strait of Dover, was an outpost of English power during the time of the Hundred Years' War. It was captured by Edward III of England, in 1347, after a siege of 11 months, and came to be regarded as the brightest jewel in the English crown. This boast was written over one of its own gates:

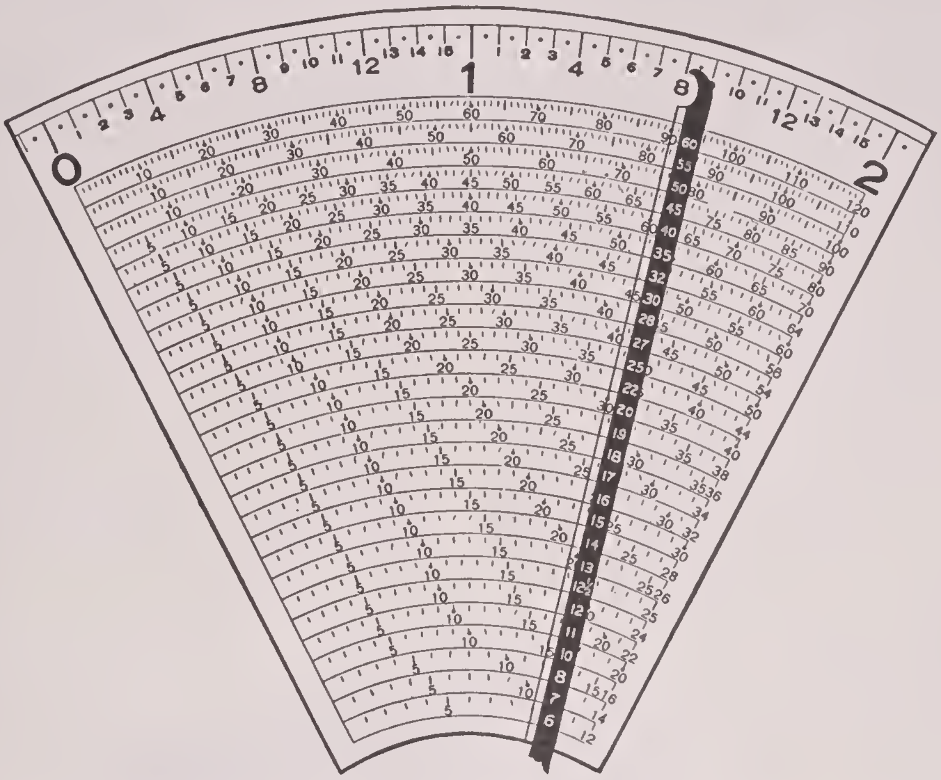
Then shall Frenchmen Calais win,
When iron and lead like cork shall swim.

However, it was recaptured by France in 1558, in the time of Queen Mary Tudor, who declared as she lay on her death-bed that Calais would be found graven on her heart.

Calais today has a good harbor and is connected with Dover by steamer and by a submarine telegraph. It is one of the chief ports for passengers coming from or going to England, and it is also a manufacturing center. It is defended by a ring of forts and regions of marshy ground on the south and east, which can be easily flooded.

In the World War of 1914–18, Calais was one of the French "Channel ports" which the Germans tried again and again to capture. Had they succeeded they could have hindered the shipment of English troops and supplies to France, and even bombarded English coast towns with their long-range guns. Population, about 75,000.

HOW SCALES FIGURE OUT PRICES



The black figures at the top show the weight. The figures on the pointer indicate prices per pound. When goods are weighed, you find the price per pound on the pointer and the selling price is the first figure to the left of the pointer in that row. As the scales stand, 1½ pounds are on the platform. The price, let us say, is 40 cents a pound. The number to the left of the "40" on the pointer is "60," which is the amount to be paid.

CALCIUM. Nearly every drink of water you take gives you some calcium salts, for "hard" water, such as comes from wells, springs, and rivers, gets this quality from compounds of calcium and magnesium dissolved in it.

Calcium is a white or yellowish metal of no great importance in itself, but its compounds are very common and useful. Combined with phosphoric acid it makes *calcium phosphate*, which constitutes a large part of the bones of human and animal skeletons, and is very necessary to plant growth. Limestone, marble, chalk, Iceland spar, coral, pearls, egg-shells, etc., are all made up mainly of *calcium carbonate.* Marble is a limestone which has undergone changes due to heat and pressure and has become crystalline (*see* Limestone; Marble). Chalk is composed of calcium deposits which formerly were parts of minute organisms (*see* Chalk).

Iceland spar is in the form of transparent and colorless crystals which have the power of producing double refraction of light and hence are used in the making of certain optical instruments. Calcium carbonate dissolves in ordinary waters, since they contain carbonic acid, and from such waters are formed the stalactites and stalagmites found in limestone caverns. The dripping water gradually evaporates and leaves a deposit of calcium carbonate in beautiful and fantastic forms.

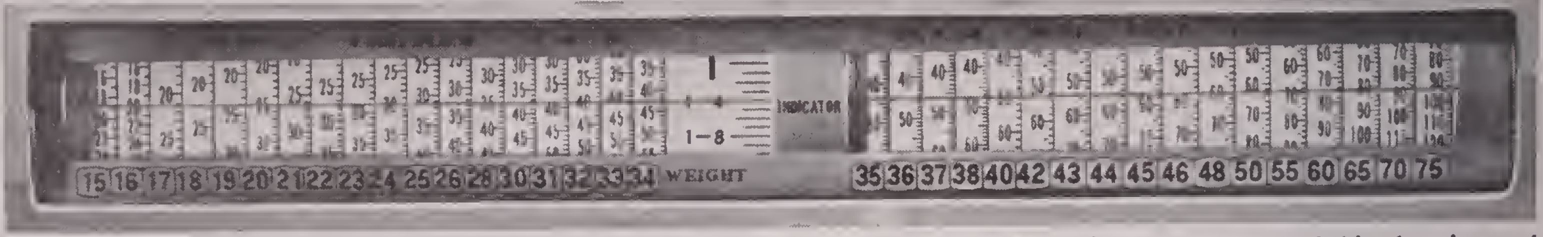
Quicklime is the oxide of calcium; when exposed to air it takes up carbon dioxide and becomes calcium carbonate. It is then said to be "air-slaked" and is useless as lime (*see* Lime). "Water-slaked" lime is *calcium hydroxide.* When mixed with sand and hair it forms plaster; it absorbs carbon dioxide and then becomes calcium carbonate. Since there is little carbon dioxide in the air, there is plenty of time to put the plaster on the wall before it hardens.

Gypsum and plaster of Paris are *calcium sulphate* (*see* Gypsum). *Calcium carbide* is made by heating pulverized limestone or lime with coke in an electric furnace. With water, calcium carbide produces acetylene gas (*see* Acetylene). Calcium carbide is also used in one of the new processes for the fixation of nitrogen. When strongly heated with nitrogen gas, it gives a mixture of carbon and calcium cyanamide which is a widely used nitrogen fertilizer. When this calcium cyanamide is treated with hot water or super-heated steam, it produces calcium carbonate and ammonia (*see* Ammonia; Nitrogen).

CALCULATING MACHINES. These wonderful little machines add, subtract, multiply, divide, and perform other mathematical operations that make them indispensable aids in banks, post-offices, insurance offices, government bureaus of statistics, large business houses—wherever figures are constantly dealt with on a large scale. There are machines for every need, from the tiny reckoner for the retail merchant who deals only with figures of five digits or less, to the amazing "duodecillion" machine, which will give results up to 40 digits. To get an idea of the prodigious size of a duodecillion, suppose you had an income of $1,000,000 a second. Before this amounted to a duodecillion dollars, 352,331,022,041,828.731,333,333,333 years would elapse.

Besides these machines, there are other that perform the most intricate mathematical calculations involving logarithms and geometry. One of these, called the "tide predictor," will deliver in about two hours a tracing showing the movements of the tide at a given port for a year in advance. One of the most remarkable machines ever built is the electric tabulator used by the United States Census Bureau, which adds and records simultaneously statistics under 240 classifications (*see* Census).

THE CLEVER MACHINE AND THE BEEF ROAST



In another type of scale, the figures that give the answer are on a cylinder inside a case. Across the center of this glass is a red line indicator. The row of large figures across the bottom are prices per pound. When you buy, say, a pound and a quarter of beef at 40 cents a pound, you read the number which is beneath the red line and directly above the "40" in the bottom row. You see it's "50," and that's what you pay.

The simplest type of adding machine is that used in the street-car fare register and in the automobile speedometer. It is essentially a series of disks each bearing around the edge the numbers from 0 to 9. The disk at the right turns one step at each count. When this has taken ten steps, or made a complete revolution, the next disk moves up one count, thus registering the "tens." In the same way when the "tens" disk has made a complete revolution, the third disk moves up one count, thus registering the "hundreds."

The ordinary adding machine works in precisely the same way, except that instead of adding only one unit at a time, it can add any desired number, by means of a complicated system of interlocking wheels. Each disk is controlled by a separate row of keys. To add 222 to 111, the "1" key is pressed down in each column. A turn of a lever causes each disk to move to the "1" position. Then the "2" keys are pressed down in each column, the lever is pulled, and each disk moves two more steps, thus giving the result, 333.

THIS IS AN ADDING MACHINE

You can get the total of a column of figures a yard long simply by pressing down the corresponding numbers on the keys, and pulling down the lever after each number. If you want to add 45 and 123, you push down the "4" in the second row from the right and the "5" in the first row and pull the lever. Then you push "1", "2", and "3" in the same way and pull the lever. Then you press that button in the upper corner, pull the lever again, and the machine prints the total—168.

To multiply with this machine, it is necessary to treat multiplication as successive additions. For example, to multiply 8 by 4, one would have to add 8 to itself three times. Ingenious mechanism has been contrived whereby this is done by a single pull of the lever. Division is similarly performed as successive subtractions.

Instead of disks some machines use cylinders with rows of ridges, but the principle is the same. So elaborate are some of the electrically operated machines that they perform all the operations of bookkeeping and automatically post ledgers and statements.

The father of the calculating machine was Blaise Pascal, a wonderful French mathematician and philosopher, who in 1641, when he was 19 years old, produced the first machine that would carry tens. No great improvements were made until 1820, when C. X. Thomas, an Englishman, brought out a machine which he called the "arithmometer." In 1822 another Englishman, Charles Babbage, conceived the idea of a great calculating machine to perform the extended algebraic computations needed in astronomy and navigation. He spent more than $100,000 on this, but it was still unfinished at his death in 1871.

The man who did the most to make the calculating machine a practical commercial success was an American, William S. Burroughs. When his health broke down, in 1883, under the strain of bookkeeping in a bank, Burroughs set about making a machine which would make much of this drudgery unnecessary. For eight years he experimented ceaselessly and finally, in 1891, he produced a machine which is in essentials unchanged today. So this tired bank clerk revolutionized the world's bookkeeping. (*See also* Cash Register.)

Calcutta, India. Because of its position on the westernmost arm of the great Ganges River, Calcutta, the largest city of India and the capital of Bengal, has become one of the greatest clearing-houses of Asiatic trade. It lies about 80 miles from the Bay of Bengal on the left bank of the Hugli River. Historically, Calcutta is intimately associated with the foundation of British rule in India. The first settlement was made by Job Charnock of the East India Company in 1690, and the colony slowly prospered after the building of Fort William.

The chief episode in Calcutta's development centers about the "Black Hole" tragedy, following its capture in 1756 by Suraj-ud-Dowlah, the Nawab of Bengal. The 146 English prisoners were forced into a cell 18 by 14 feet on a hot June night. The next morning only 23 were alive. The city meanwhile was plundered and burned, and it was not until seven months later that an English army under Clive, from Madras, recaptured it. In 1757, exactly a year after the tragedy of the Black Hole, Clive defeated Nawab at Plassy, and the province of Bengal fell into British hands. Bengal may be called the entering wedge that was driven by the East India Company into the anarchy and confusion of India after the waning of the native Mogul authority at Delhi. In 1772 the great administrator Warren Hastings, first governor-general of Bengal for the East India Company, moved the seat of government to Calcutta, where it remained until 1911, when the ancient Indian capital Delhi replaced it.

With its numerous docks and wharves Calcutta is not only a great center for ocean traffic, but also through the two great rivers the Ganges and Brahmaputra it taps the fertile plains and valleys of northern India. The river traffic, chiefly carried on in small native boats, competes with the three great railways centering in Calcutta. Thus Calcutta is one of the principal outlets for the richest sections of India. Bengal is itself a rich fertile province, producing most of the jute in the world, as well as rice, opium, cotton, and coal. Calcutta contains numerous jute and cotton mills, though they do not rival those of Bombay in size and number.

Calcutta does not present the same magnificent and modern architectural prospect that greets the traveler in the newer city of Bombay. It recalls more readily the memories of men like Clive and Warren Hastings, who laid the foundations of British rule in India, as well as of those great English merchants or "nabobs" of the 18th century, such as are described in some of the novels of Thackeray, who was himself born in Calcutta. Calcutta has peculiar pride in its parks, which were created on the sites of the dismal swamps that took such a heavy toll of lives in the past. The zoölogical and the Eden gardens, the Maidan or park, relieve the rows of monotonous business buildings. Across from the park the old houses of the wealthy merchants of the early 19th century have been converted into hotels, clubs, and business buildings.

Calcutta is an important educational center. Here are located a university and numerous colleges and high schools. There is also an art museum where many rare and beautiful relics of India's ancient glory are exhibited. The city is governed, like Bombay, by a general committee of 12 members, to whom many important matters are referred, and to which both Europeans and natives are elected. Population, about 1,225,000.

How TIME *is* RECKONED—CURIOSITIES *of the* CALENDAR

HOW do you know when Christmas comes or how old you are; how does the farmer know when to do his spring planting, and the bank when the promissory notes that it holds come due? By looking at the calendar, you say. Yes, but what is the calendar? In this article you will find an explanation of the chief systems of reckoning time, together with a Perpetual Calendar which enables you to find the day of the week for any date from the year 1600 to 2399.

CALENDAR. Even savages have their rude systems of counting time by days and months and seasons, and so have the beginnings of a calendar. Very early the sun's seasonal progress was discovered and men began to use the year as a larger unit in keeping track of time. But with what event should they start in their reckoning?

The Greeks dated everything from the beginning of the so-called Olympic Register, a traditional list of the victors in the Olympic games starting with the year 776 B.C., according to our reckoning. The Romans counted time from the founding of their city in 753 B.C. The Mohammedans reckon dates from the "Hegira," or flight of Mohammed from Mecca, in 622 A.D.

The Mistake in the Christian Calendar

Christian nations now date events from the birth of Christ. But this practice did not come into use until about the time of Charlemagne (9th century), and a mistake was made which placed Christ's birth about five years too late. Thus, although we reckon everything from the birth of Christ, scholars now tell us that that event occurred five years before the beginning of what we call the Christian era.

It must not be forgotten in reckoning time before the beginning of the Christian era (marked "B.C.") that the longer ago an event occurred the *larger* is the number of the year, because we are counting backwards. For instance, the Olympian games of 776 B.C. were held 23 years *before* the founding of Rome, which is supposed to have taken place 753 B.C. The year 150 B.C. was 100 years *before* 50 B.C.; but the year 150 A.D. (*Anno Domini*), or after Christ, was 100 years *after* 50 A.D., because here we are counting forward, 1, 2, 3, 4, etc., instead of backward, 4, 3, 2, 1.

We also divide time before and after the birth of Christ into periods of 100 years or centuries. Thus the years between the time of the birth of Christ and 100 A.D. are in the *first* century; from 100 to 200 A.D. is the *second* century, etc. The years between 1900

CALENDAR FOR THE YEARS 1600 TO 2399

TO FIND THE DAY OF THE WEEK FOR ANY DATE

Look at the top of the table for the century; then to the left (years 1 to 50) or the right (years 51 to 100) for the year. In a horizontal line with the year, and directly under the century, is the Dominical Letter for the year. In the lower part of the table find the month and the day of the month. In a horizontal line with this, under the Dominical Letter just found, is the day of the week sought.

The purpose of the Dominical Letter is to show on what day of the year the first Sunday comes. This fixes the relation of the days of the week to the days of the month for the whole year. Thus, if the first Sunday comes on Jan. 1, the year has the Dominical Letter A; if on Jan 2, the letter B; if on Jan. 3, the letter C; and so on. Only the first seven letters of the alphabet (A to G) are used.

Years 1 to 50									CENTURIES							*Years 51 to 100*								
									2000		2100		2200		2300									
									1600		1700		1800		1900									
	6		17	23	28	34		45	A	B	C	D	E	F	G	51	56	62		73	79	84	90	00
1	7	12	18		29	35	40	46	G	A	B	C	D	E	F		57	63	68	74		85	91	96
2		13	19	24	30		41	47	F	G	A	B	C	D	E	52	58		69	75	80	86		97
3	8	14		25	31	36	42		E	F	G	A	B	C	D	53	59	64	70		81	87	92	98
	9	15	20	26		37	43	48	D	E	F	G	A	B	C	54		65	71	76	82		93	99
4	10		21	27	32	38		49	C	D	E	F	G	A	B	55	60	66		77	83	88	94	
5	11	16	22		33	39	44	50	B	C	D	E	F	G	A		61	67	72	78		89	95	

LEAP YEARS

Every leap year has two Dominical Letters—one before March 1 and the other from that day on. The latter only is given in the table. The Dominical Letter for the first part of the year (to March 1), is always *the next letter in the series*. Thus the year 1920 has the letter C in the table, which gives us the days of the week from March 1 to December 31, inclusive. For the first part of 1920 (from Jan. 1 to Feb. 29, inclusive) the Dominical Letter is D (the next letter in the series). If the letter for any leap year in the table is G (for example, the year 1860), we begin over again and take the letter A as the "next letter" in the series, giving us the key for the period Jan. 1 to Feb. 29.

Ordinarily a year is a leap year if it is divisible by 4, but years which end with two ciphers are not leap years unless they are divisible by 400.

DOMINICAL LETTERS

Jan. (31 days) Oct. (31 days)					*Feb. (28 or 29) March (31 days) Nov. (30 days)*					*April (30 days)*						*May (31 days)*					*A*	*B*	*C*	*D*	*E*	*F*	*G*	*June (30 days)*					*July (31 days)*						*Aug. (31 days)*					*Sept. (30 days) Dec. (31 days)*					
1	8	15	22	29		5	12	19	26		2	9	16	23	30		7	14	21	28	S.	Sat.	Fr.	Th.	Wed.	Tu.	Mon.		4	11	18	25		2	9	16	23	30		6	13	20	27		3	10	17	24	31
2	9	16	23	30		6	13	20	27		3	10	17	24		1	8	15	22	29	Mon.	S.	Sat.	Fr.	Th.	Wed.	Tu.		5	12	19	26		3	10	17	24	31		7	14	21	28		4	11	18	25	
3	10	17	24	31		7	14	21	28		4	11	18	25		2	9	16	23	30	Tu.	Mon.	S.	Sat.	Fr.	Th.	Wed.		6	13	20	27		4	11	18	25		1	8	15	22	29		5	12	19	26	
4	11	18	25		1	8	15	22	29		5	12	19	26		3	10	17	24	31	Wed.	Tu.	Mon.	S.	Sat.	Fr.	Th.		7	14	21	28		5	12	19	26		2	9	16	23	30		6	13	20	27	
5	12	19	26		2	9	16	23	30		6	13	20	27		4	11	18	25		Th.	Wed.	Tu.	Mon.	S.	Sat.	Fr.	1	8	15	22	29		6	13	20	27		3	10	17	24	31		7	14	21	28	
6	13	20	27		3	10	17	24	31		7	14	21	28		5	12	19	26		Fr.	Th.	Wed.	Tu.	Mon.	S.	Sat.	2	9	16	23	30		7	14	21	28		4	11	18	25		1	8	15	22	29	
7	14	21	28		4	11	18	25		1	8	15	22	29		6	13	20	27		Sat.	Fr.	Th.	Wed.	Tu.	Mon.	S.	3	10	17	24		1	8	15	22	29		5	12	19	26		2	9	16	23	30	

Suppose you knew that Abraham Lincoln was born on Feb. 12, 1809, and wanted to know what day of the week that was. This Perpetual Calendar will tell you. It will also help you to find the day of the week on which you were born, or on which any historical event occurred since the year 1600. In the same way, you can tell from this table on what day of the week Christmas and other celebrations will fall, up to the year 2399.

and 2000 are in the 20th century, in which we are now living. In reckoning time *before* the birth of Christ, we count the centuries back from that event, just as we do the years.

How Leap Year Helps Out in the Calendar

One of the difficulties in dealing with the calendar arises from the fact that the solar year cannot be divided evenly into months and days, because the time actually required for the earth's journey around the sun is 365 days 5 hours 48 minutes and 46 seconds. In the old "Julian calendar," prepared by astronomers under order of Julius Caesar, every fourth year was made a "leap year," and was given an extra day, making it 366 days long. But correction by a whole day every four years was too much, and after this calendar had been in use for over 1,500 years it was found that the calendar year was about 10 days behind the solar year. Thus in 1582 when the sun crossed the equator in the spring (vernal equinox), the date by the calendar was March 11 instead of March 21, as it should have been.

So Pope Gregory XIII directed, as a result of studies by the astronomers, that 10 days be dropped from the calendar that year, and that the day after Oct. 4, 1582 should be October 15. To keep the calendar year and solar year together thenceforth it was directed that three times in every 400 years the leap year arrangement should be omitted. This is accomplished by not counting as leap years the years ending in two ciphers, unless they are divisible not by four, but by 400. Thus 1600 remained a leap year, but 1700, 1800, and 1900 were not. This arrangement will keep the calendar year and solar year together until the year 4000, by which time the difference will again have amounted to one day.

The new calendar was called the Gregorian or New Style calendar, while the Old Style was used when time was counted by the old Julian calendar. The Gregorian calendar was adopted almost immediately by Roman Catholic countries, but Protestant and Greek Catholic nations were slow to accept it. It was not adopted in England until 1752, when it was necessary to drop 11 days. The foolish people were very much aroused at this, and held great meetings and went about in processions crying, "Give us back our 11 days!" Russia did not accept the New Style until the revolution in 1917, when there was a difference of 13 days between the two calendars.

Another reform which the Gregorian calendar effected was the fixing of the time for the beginning of the year. Different times for beginning the year had been used—some countries beginning it with

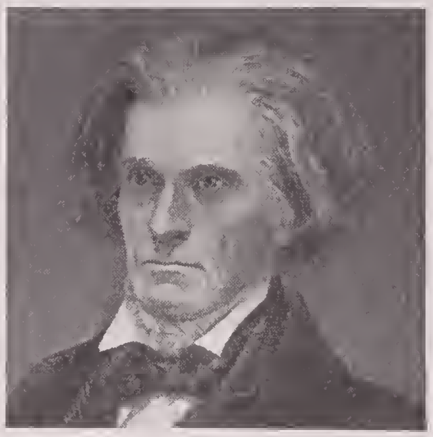
December 25, others with March 25, and the like. Now January 1 was fixed as the year's beginning.

This change in the calendar is the reason that in documents of the 18th century we frequently find dates given in two ways, Old and New Style. For instance, George Washington was born Feb. 22, 1732, N.S., or Feb. 11, 1731, O.S. Sometimes this is written Feb. $\frac{11}{22}$, 173$\frac{1}{2}$. The Pilgrims landed at Plymouth on Dec. $\frac{11}{21}$, 1620, and according to Governor Bradford, they "began to erect the first house" on Dec. 25, 1620, O.S. In the New Style calendar this was Jan. 4, 1621. (*See also* Day; Month; Week.)

CALGARY, ALBERTA. The rapidly growing city of Calgary is not only one of the most picturesquely situated towns of the Canadian Northwest, but it is also the largest and most important commercial center of the great prairie regions of Canada west of Winnipeg. Lying at the junction of the Bow and Elbow rivers, girdled with swelling hills and the distant snow-clad peaks of the Rocky Mountains, the city has scenery which is unsurpassed. Calgary sprang up with the coming of the Canadian Pacific Railway in 1883, but has a substantial appearance not often found in the "boom" towns of the west. This comes from the fact that it was built largely of the gray stone which is quarried in the neighborhood.

An immense cattle-raising and wheat-growing region of about 150,000 square miles centers in Calgary, which is the shipping as well as the distributing point for the entire district. It is also the chief supply station for the mines of the eastern Rockies. Stockyards, packing plants, flour mills, and grain elevators are the most important industrial establishments, though other manufactures are rapidly growing. Biscuit boxes and breakfast foods are other products. Hydroelectric power is supplied by the nearby rivers, and natural gas is piped in 100 miles from Bow Island. Petroleum has been found in the vicinity, but development is as yet on only a small scale. Great areas of coal near by provide cheap fuel, and building stone is abundant. Calgary is also an important railway center, since it lies near the entrance to two passes through the Rocky Mountains. The street railway, waterworks, and asphalt paving plant are municipally owned; taxation is based on a modified form of single tax. Population, about 65,000.

CALHOUN, JOHN CALDWELL (1782–1850). More tragical than any tragedy ever conceived by the imagination of man, says an eminent historian, is the record of this powerful and distinguished champion of nullification, secession, and negro slavery. Born in the same year with Daniel Webster and dying two years before that great statesman, Calhoun at the height of his career stood at the opposite pole of politics from Webster—the defender of the South, as Webster was of the North, of States' Rights as Webster was of National Sovereignty. Successively member of Congress at the time of the War of 1812, secretary of war under President Monroe, vice-president with John Quincy Adams and again with Andrew Jackson, secretary of state under President Tyler, and for many years senator from South Carolina, in his 40 years of public life Calhoun did more than any other man to form the views of the South on constitutional questions, and to instil in it that conviction that slavery was a positive good, which in the end produced the Civil War.



JOHN C. CALHOUN
Champion of States' Rights

Calhoun was a son of the South Carolina hills. Born of Scotch parents on a frontier farm near Abbeville, he was left fatherless when very young and received very little early education. He was a lonely thoughtful boy, given to meditation and quiet ways. It is said that he seldom laughed, never cracked a joke in his life, and had no sense of humor. In 1800 he entered Yale College as a member of the Junior class. He was graduated two years later with highest honors, then studied and practiced law, and after a brief term in the state legislature was elected, in 1811, to the United States Congress.

Here, with young Henry Clay, he came almost immediately into prominence as a leader of the "War Hawks," a group of brilliant patriotic young men who were urging war with England. When their combined eloquence finally persuaded Congress and the President to declare war in 1812, Calhoun advocated vigorous measures. When the war was over he continued to urge the use of wide national powers. In a speech advocating government roads he said: "The extent of our country exposes us to the greatest of all calamities next to the loss of liberty—disunion. Let us bind the republic together with a perfect system of roads and canals." At this time Calhoun also favored a protective tariff, a national bank, a strong army and navy.

But during the next 12 years a change took place in Calhoun's views, and the tragedy of his public life began. The ardent nationalist became the no less ardent champion of States' Rights. In 1828 the cotton-growing states of the South, especially South Carolina, were furious at what they bitterly called the "tariff of abominations," a tariff which they claimed levied tribute on the South for the benefit of manufacturing New England. Flags were flown at half-mast; threats were made to disobey the law and even to withdraw from the Union. Calhoun took up the defense of the South and wrote a paper called the 'South Carolina Exposition', in which he urged that the protective tariff of 1828 was unconstitutional and that, in such a case, the state, or states, had the constitutional right to refuse obedience to the law and declare it null and void within their limits. Four years later South Carolina tried to put Calhoun's idea of nullification into practice; but the stern attitude of President Jackson, combined with a compromise tariff put forth by Henry Clay, prevented an armed clash. From that time on Calhoun and Jackson were bitter enemies.

It was impossible to espouse the cause of the South and not uphold the institution of slavery. Accordingly, as the years passed by, Calhoun from merely tolerating slavery became its strongest defender. On one occasion he said, "I hold that in the present state of civilization, the relation now existing between the two races in the slave-holding states is, instead of an evil, a good—a positive good." In order to extend slave territory, Calhoun when secretary of state under Tyler negotiated a treaty for the annexation of Texas, although he greatly deplored the war with Mexico which almost immediately followed.

To the end of his life Calhoun was untiring in defense of his beloved South. In the debate on the Compromise of 1850 he made his last public appearance. So ill that he had to be carried into the Senate Chamber, and so weak that his speech had to be read by a colleague, his address seemed "a message of despair." As he sat there wrapped in flannels and "alive only in the great deep eyes which still flashed beneath his heavy brows" he looked, indeed, an apostle of a dead or dying cause. Within less than a month he passed away. Almost his last words were, "The South—the poor South; God knows what will become of her now." Daniel Webster, one of his chief political opponents during the 40 years of his public life, said of him what no historian would deny: "He was a man of undoubted genius and commanding talent. He had that indispensable basis of high character—unspotted integrity and unimpeachable honor." But his great abilities were used to bolster up an institution which was both morally and politically wrong—the institution of human slavery.

The RICHES *of the* GOLDEN STATE

Here we are looking at the beautiful Golden Gate, through which commerce flows in and out of the great harbor of San Francisco Bay. San Francisco lies to the south of the Golden Gate on a hilly peninsula. It is through this gate that the waters of the great region drained by the Sacramento and San Joaquin rivers reach the sea.

Extent.—North to south, about 780 miles; east to west, average width, 250 miles; coast line, over 1,000 miles. Area, 158,297 square miles. Population (1920 census), 3,426,861.

Natural Features.—Coast Range, bounding the great central valley of California on the west; Sierra Nevada Range (11 mountain peaks over 14,000 feet; Mt. Whitney, the highest point in the United States, 14,502 feet); Yosemite Valley; Death Valley, 276 feet below sea-level, the lowest point in the United States. Principal rivers: San Joaquin and Sacramento, draining the great valley through the Golden Gate.

Chief Products.—Fruit and nuts, hay, barley, wheat, rice, cotton, and sugar beets; canned and preserved fruits, fish, and vegetables; lumber and timber products; petroleum and petroleum products; gold, copper, silver, borax, quicksilver, clays, etc.

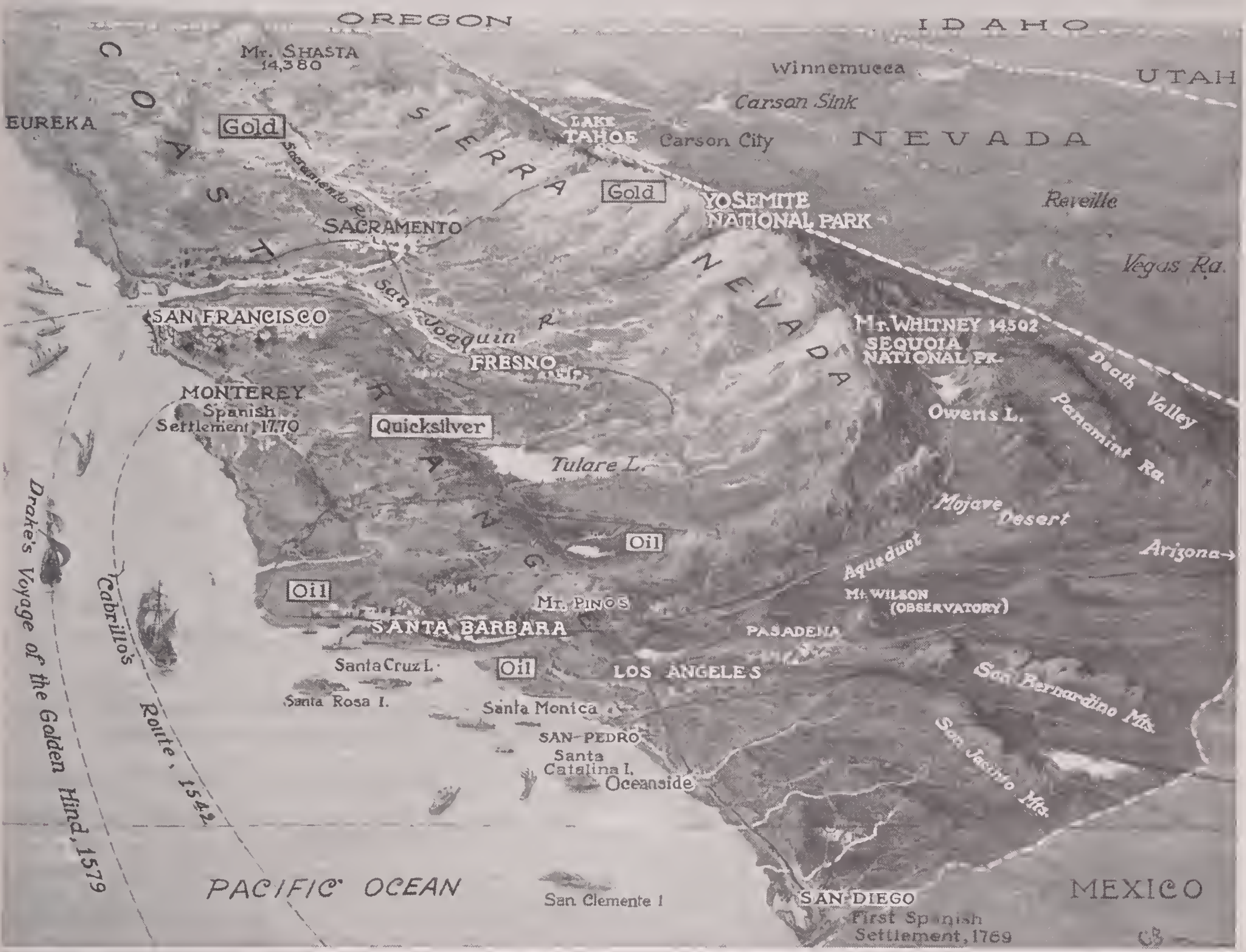
Principal Cities.—Los Angeles (about 580,000), San Francisco (510,000), Oakland (217,000), San Diego (75,000), Sacramento (capital, 66,000), Berkeley, Long Beach, Pasadena, Fresno, Stockton, San José.

CALIFORNIA. "The Golden State," the second largest state in the Union, and two and a half times as large as all New England, is the sun-child of the nation—a warm smiling land blessed with a variety of climate, crops, and minerals without parallel in North America. It fronts nearly 1,000 miles upon the waters of the Pacific, from Oregon to Mexico, and averages 250 miles in width, between the ocean and the filmy crests of the Sierra Nevada Mountains, which form its eastern wall and boundary.

Long ranges of mountains stripe the state from north to south, as though a mighty plow had furrowed it. Forty miles from the sea are the ridges of the Coast Range, and between them and the great Sierra Nevadas to the east lies the trough, 400 miles long, known as the Great Valley of California. Only in one place is the western wall of this trough broken down—at the Golden Gate of San Francisco where the waters of the Sacramento and San Joaquin have cut a mile-wide channel to the ocean.

What wonders, what contrasts, are held in this mountain-ribbed land! Mt. Whitney, a lovely Californian peak, 14,502 feet high, is one of the highest points of land in the United States (excluding Alaska),

A LAND OF RICHES AND ROMANCE



This relief map will help you to grasp the meaning of California, the vast extent of its territory, the variety of its climate, the richness and variety of its resources and the romance of its history. Viewing it as it would look if we were flying high in the heavens above San Diego, where the first Spanish settlement was made, we would see its two great mountain ranges with the valleys of the Sacramento and San Joaquin between; Mt. Whitney, the highest point in the United States, Mt. Shasta, only a little lower; Mt. Wilson, famous for its observatory; the gold regions and the lands of oil and quicksilver; wonderful Los Angeles with its 240-mile aqueduct reaching up to a lake near Mt. Whitney; and San Francisco, with its ocean commerce.

and the famous Death Valley, only about 60 miles away, is the lowest land, nearly 300 feet below sea level (*see* Death Valley). In southeastern California lies a blazing tawny desert, with never more than the lightest sprinkling of rain, often burning at 120 degrees in the shade. And nearly a thousand miles off in the northwestern corner, the green, cathedral-like forests of Del Norte County grow thick and dark through the dripping days. Scenes of indescribable grandeur abound along the western face of the Sierras, where rushing torrents have worn great canyons like that of the Yosemite, as they plunge on their way to join the Sacramento and San Joaquin.

Thousands of tourists visit California every year. They come to treasure up the austere wisdom of the majestic sequoias, old as the pyramids; the peace of far white mountains; the graceful courage of plunging waterfalls; the glassy blue of glacial lakes; the perilous beauty of sheer canyon walls—all the unnumbered marvels of this favored land.

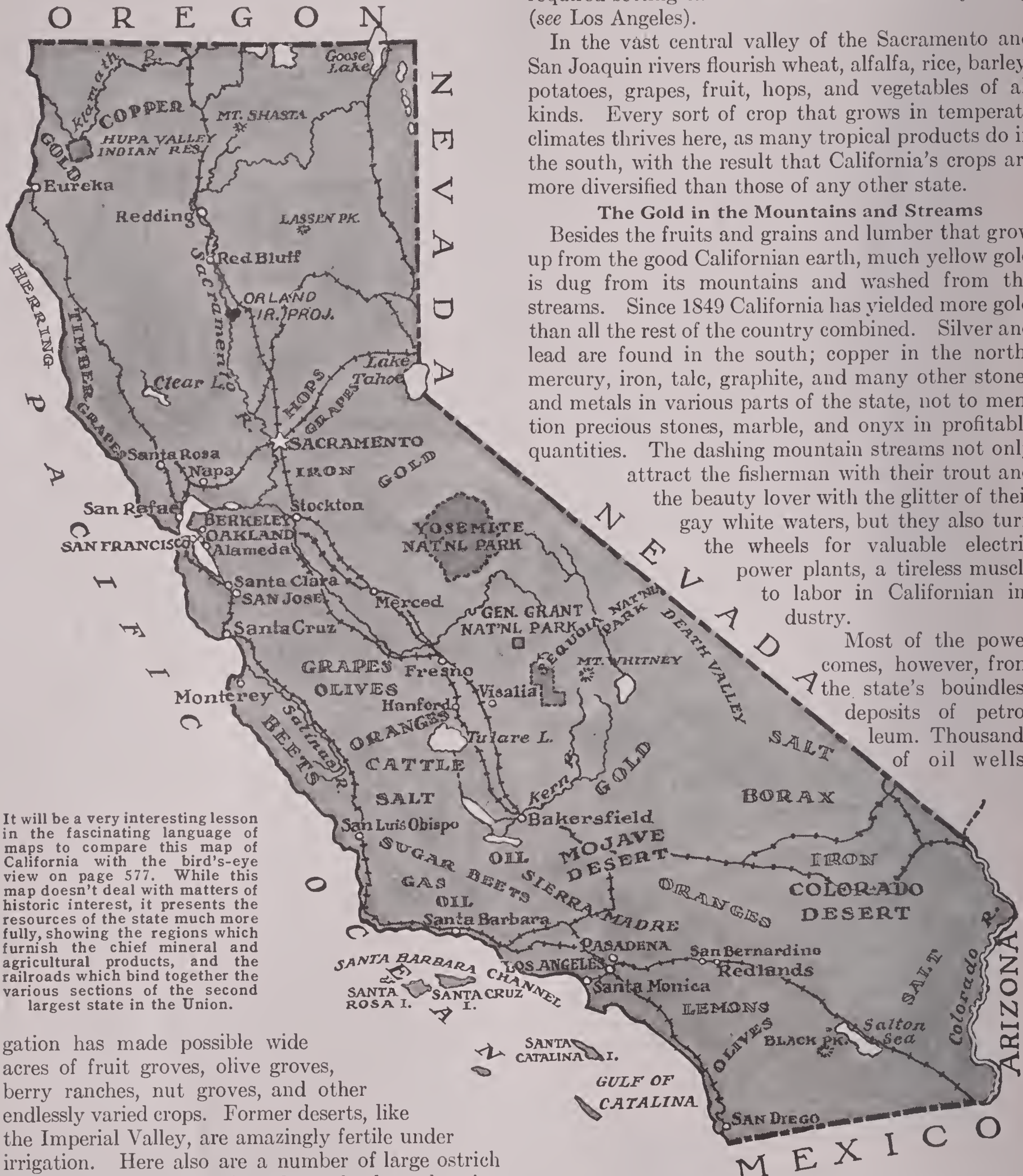
Naturally, in a country where the rain pours down 80 inches annually in one place, and where the sun burns and desolates the soil in another, and where flat rich valleys adjoin pine-covered mountains, all sorts of crops may be grown, many industries flourish, and enormous grist is sent to the mill of the world.

Lumbering is the industry of the northern coast, where the tall spires of the giant redwoods and sequoias have been pointing sunward for centuries (*see* Sequoia). Glossy dairy herds feed in the sweet green meadows of the middle coast, where dairymen—many of them immigrants from Switzerland, Italy, and Portugal—produce great quantities of appetizing butter and cheese.

The Fairyland along the Sea

The luxurious winter resorts, with their fairyland of bathing beaches, wild mountain scenery, fruit groves, and continual flowers, are to be found along the southern coast. The southern interior east of this region is California's reclaimed desert, where irri-

CALIFORNIA'S RESOURCES AND RAILROADS



It will be a very interesting lesson in the fascinating language of maps to compare this map of California with the bird's-eye view on page 577. While this map doesn't deal with matters of historic interest, it presents the resources of the state much more fully, showing the regions which furnish the chief mineral and agricultural products, and the railroads which bind together the various sections of the second largest state in the Union.

gation has made possible wide acres of fruit groves, olive groves, berry ranches, nut groves, and other endlessly varied crops. Former deserts, like the Imperial Valley, are amazingly fertile under irrigation. Here also are a number of large ostrich farms, and many apiaries where the bees, buzzing over the orchard blossoms, accumulate tons upon tons of honey. The world's leading center of the motion picture industry is at Los Angeles, brought thither by the perfect weather conditions, and the fact that scenery of every type is within easy reach of the scores of studios. Whether the scene of the play be tropical Africa or India, arctic Alaska or Switzerland, mountainous South America, or the barren deserts of Palestine and the Sahara, places that provide the required setting can be found within a short journey (*see* Los Angeles).

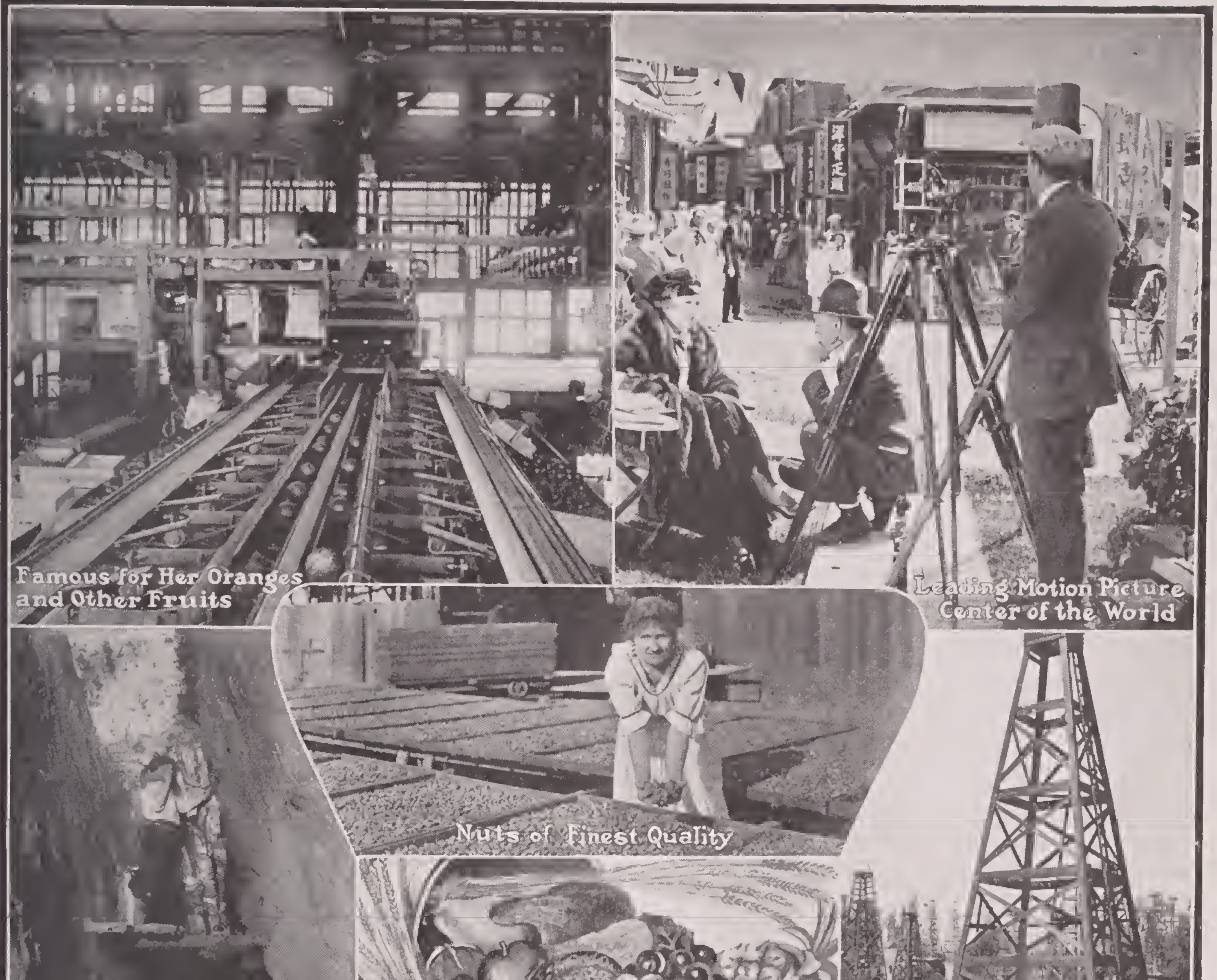
In the vast central valley of the Sacramento and San Joaquin rivers flourish wheat, alfalfa, rice, barley, potatoes, grapes, fruit, hops, and vegetables of all kinds. Every sort of crop that grows in temperate climates thrives here, as many tropical products do in the south, with the result that California's crops are more diversified than those of any other state.

The Gold in the Mountains and Streams

Besides the fruits and grains and lumber that grow up from the good Californian earth, much yellow gold is dug from its mountains and washed from the streams. Since 1849 California has yielded more gold than all the rest of the country combined. Silver and lead are found in the south; copper in the north; mercury, iron, talc, graphite, and many other stones and metals in various parts of the state, not to mention precious stones, marble, and onyx in profitable quantities. The dashing mountain streams not only attract the fisherman with their trout and the beauty lover with the glitter of their gay white waters, but they also turn the wheels for valuable electric power plants, a tireless muscle to labor in Californian industry.

Most of the power comes, however, from the state's boundless deposits of petroleum. Thousands of oil wells, many of them put down from piers into the bed of the ocean, produce the heavy oil fuel which is burned in nearly all the California locomotives and in the greater proportion of the factories. California owes its recent rise to a position among the ten leading manufacturing states to the discovery of these petroleum resources and to the harnessing of the streams, for it has little coal.

A CALIFORNIA PICTURE SHOW



Famous for Her Oranges and Other Fruits

Leading Motion Picture Center of the World

Nuts of Finest Quality

A Wealth of Gold and Many Other Minerals

Widest Variety of Crops

Immense Oil Deposits

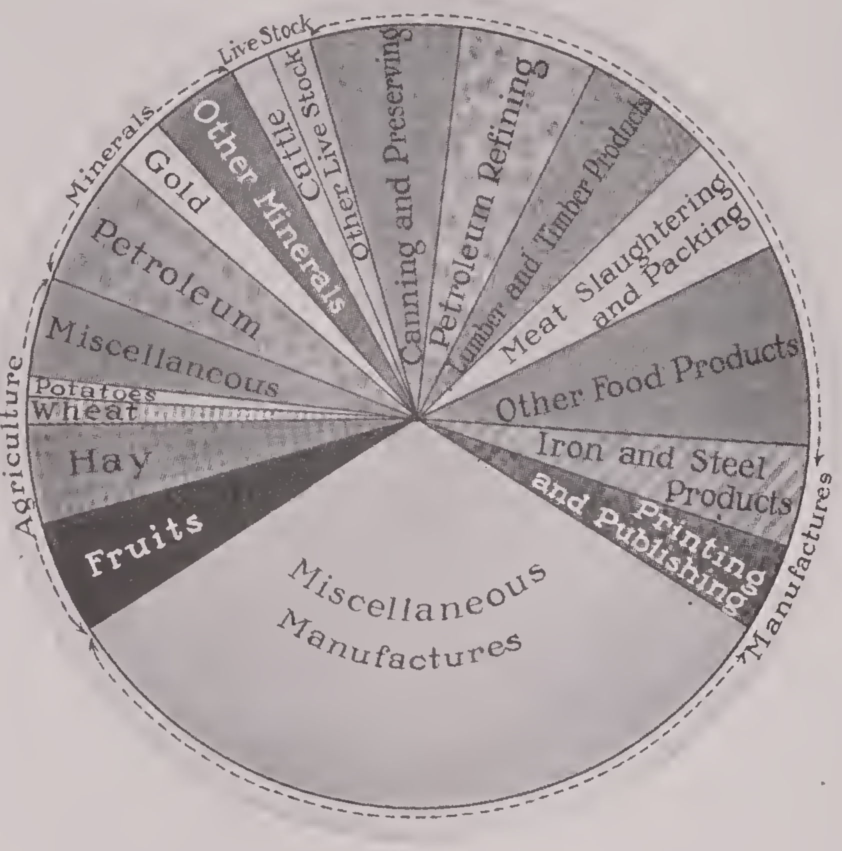
Supplies Large Quantities of Fine Timber

Extensive Canneries

California not only has the leading motion picture producing centers of the world, but such is the variety and interest of life in this vast empire on the Pacific coast that scenes from its life make a most attractive picture show in themselves. To the left of the movie people is shown an automatic machine for sorting California's famous oranges. The miner at work typifies the state's wealth in gold and other minerals, the oil derricks, her oil deposits, the huge cigar-shaped rafts, her timberlands and saw mills, while the young lady in the center is not going to let us forget that California also produces nuts of the finest quality, as well as every variety of fruits and vegetables.

The industries include sugar and oil refineries, fruit and vegetable canneries, dairies, flour and lumber mills, meat packing establishments, shipyards, machine shops, and tanneries; and these products, together with the raw materials of the state, have drawn to her great harbors of San Francisco and San Diego the ships of all the world. Five transcontinental railways also seek her out from the east.

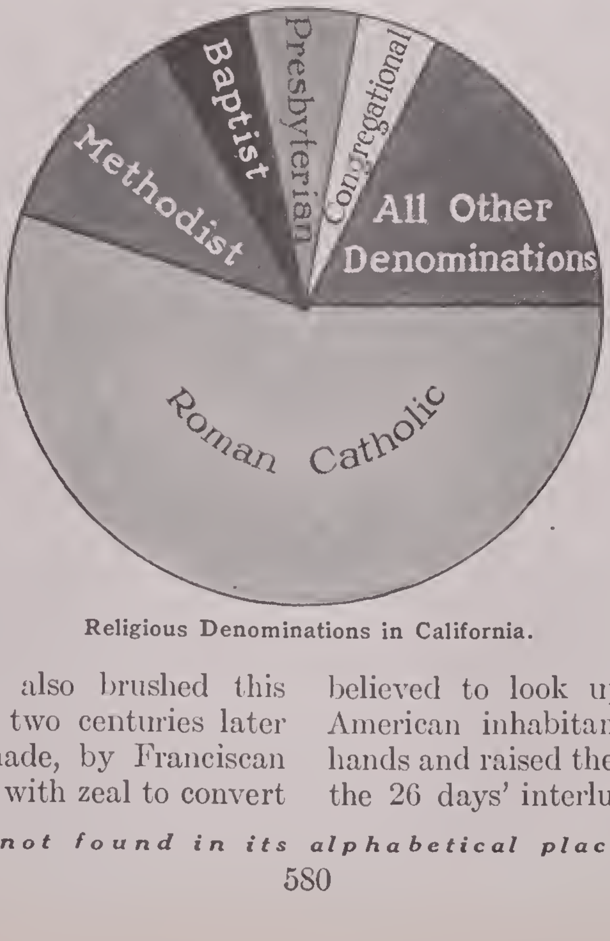
A GRAPHIC COMPARISON OF CALIFORNIA'S INDUSTRIES



Although California has long been famous for its gold mines. the value of the gold output is not so large as that of the petroleum and other minerals produced, and, when compared with the state's agricultural and manufacturing interests, is very small indeed.

The diversified population which the state has attracted from all quarters of the United States, and other countries as well, is conspicuous for its interest in education. No state has a larger proportionate enrollment of college students. Besides some ten smaller institutions, there are two world-famous universities in the state, the State University at Berkeley and Leland Stanford Jr. University at Palo Alto.

The history of this fortunate region is as strange and poetic as the land itself. Centuries before gold was discovered there or the agricultural riches developed, old Spanish romancers told of a mythical California, an island where abundance of gold and precious stones was to be found, and in Mexico, the "New Spain" of the early 16th century, tremendous tales circled around concerning the riches of the unknown lands to the north. The thrilling fictions excited the Spaniards and sent them searching for the land of gold. In 1542 Juan Rodriguez Cabrillo sailed a ship under the flag of Spain into the bay of San Diego. The next white man to leave a footprint on California shores was the Englishman Sir Francis Drake, in 1579.



Religious Denominations in California.

Other venturesome seafarers also brushed this coast of wonder, but not until two centuries later was a permanent settlement made, by Franciscan monks from Mexico who burned with zeal to convert the Indians. The first mission was at San Diego, with the heroic Father Junipero Serra as the guiding light. Famine, sickness, and hostile Indians all but drove him from his mission. But as he begged his companions for "one more day" and knelt praying on Presidio hill for a relief ship from New Spain—behold! a white sail did appear, relief came, the little colony stayed. Thus was early Californian history made by a "miracle," as the devout called it, and more than one seeming miracle has carried out her destiny.

Until early in the 19th century the brown-robed Franciscans continued their missions, stretching a chain of them for 700 miles along El Camino Real, "The King's Highway." Meanwhile Spain had established a government in California, and Monterey was made the first capital. The California of that day is pictured to us as an ideal land, unhurried, hospitable, poetic; a land of lovely women and proud cavaliers, of splendor and beauty, of pirates and adventurers, but still of peace and plenty. When Mexico threw off the yoke of Spain, California passed under Mexican rule, in 1821, yet with little change in the character and idyllic charm of her life. For another 25 years, until American domination came, California continued in her "splendid, happy idleness," with "much joy, little hate, and a contentment that was as vast as the sun and moon and stars that shone upon the white peaks of the Sierras."

But the grip of Mexico on this lotus-land was weakening. British ships nosed about its harbors, and France was also believed to look upon it with greedy eyes. The American inhabitants took matters into their own hands and raised the flag of the United States. After the 26 days' interlude of the "Bear Flag Republic,"

THE LELAND STANFORD JUNIOR UNIVERSITY

The Leland Stanford Junior University at Palo Alto, founded by Mr. and Mrs. Leland Stanford as a memorial to their only son, is patterned after the old Spanish missions. The main buildings form two quadrangles, one within another. This view shows the outer quadrangle of 12 buildings, with its surrounding arcade and beautiful campus. In the inner quadrangle are the Administrative offices, as well as the departments devoted to law, the languages, and mathematics. In the outer quadrangle are the engineering schools, the library, the assembly hall and the departments of economics, English, and history.

in 1846, American soldiers in a few sharp fights with the Mexicans took California for the United States, the names of Captain Fremont and Kit Carson standing boldly out in the affair. This conquest was confirmed by the treaty which ended the Mexican War in 1848.

In 1848 also came California's second miracle—the discovery of gold; and with it such an inrush of gold-seekers, feverish of eye and brawling in manner, that she bustled into the Union as a state in 1850—a wild lawless state, very different from the dreamy California of the Spaniards. Since then she has known other miracles—the building of the Central Pacific railroad across the Sierra Nevadas, the reclaiming of the deserts by irrigation, and the rebuilding of San Francisco in three years from the ashes of the earthquake and its fires in 1906.

A BEAUTIFUL CAPITOL IN A BEAUTIFUL CLIMATE

This view of the capitol building of California at Sacramento gives one an idea not only of the impressive grandeur of the building, but of the varied beauty of the vegetation which flourishes in this delightful climate.

Little Bits about a Great State

There is so much of novelty and importance to be said of this golden state today that only a summary of the interesting facts can be set down, as follows:

California is the longest of the states.

Every variety of climate found in North America may be found somewhere in California. The return Japan current, swinging south from Alaska, washes the northern half of the coast and aids in making it cooler than the southern half. Mountains protect the state from the Arctic winds while trade winds from the southwest help to moderate the climate.

The Great Central Valley, containing the basins of the Sacramento and San Joaquin rivers and their tributaries, is about as large as Massachusetts, New Jersey, and Delaware combined (18,000 square miles).

The highest waterfall in the world is the Yosemite (2,670 feet) in the Sierra Nevadas (*see* Yosemite Valley).

California's forests are fifth in area and second in stand of timber in the United States. They cover an area almost as great as the whole state of Pennsylvania (44,700 square miles).

In February and March one can travel 400 miles through the Great Valley, treading on flowers at every step.

California has only two seasons, the wet and the dry. For six months after May 1, rain is practically unknown.

In the vicinity of Los Angeles you may bathe in the warm Pacific in midwinter and an hour later enjoy a toboggan slide down the snowy slopes of the mountains 12 miles away.

Many of the low-lying lakes of the state are without outlet and are more or less salty.

California was the first successful grower of sugar beets, and now ranks among the leading states in production.

The total area of California farms is greater than the total combined areas of Indiana and Massachusetts (46,000 square miles).

More than 35 per cent of the farms are under irrigation.

California's hay, grain, and alfalfa fields cover an area nearly equal to that of Connecticut and Delaware; its fruit farms are more than five times as large in area as Rhode Island.

California grows more raisin grapes than any other section of the world; it produces more than three-fourths of the oranges of the United States, and 95 per cent of the walnuts and almonds. It is the only state of the United States that grows the olive in commercial quantities. Of dried fruits its output is greater than that of any other state.

In the Great Valley, especially along the Sacramento River from Yolo County north, rice growing has become one of the chief industries. Land that was formerly considered of no value has recently become a great rice section. Mills have been built to prepare the rice for market at Sacramento and other places, and California will soon produce enough rice to supply the whole of the United States.

California has the greatest range of mineral production of all the states. It has produced more gold than all the rest of the United States put together. In annual output it is first in gold, first in borax and soda, first in quicksilver, and among the leading states in petroleum and copper. It produces two-fifths of the world's quicksilver.

California leads the world in the long-distance transmission of electric power from mountain streams.

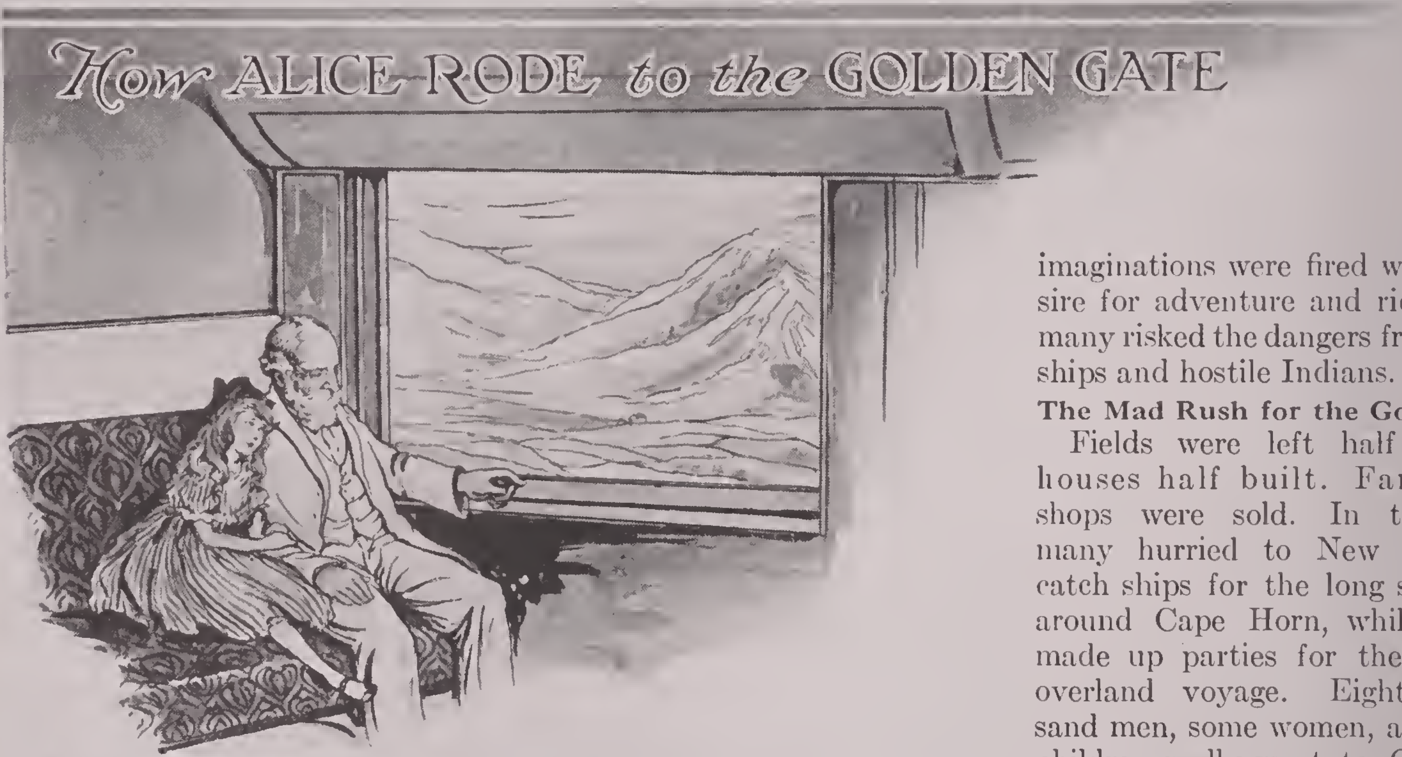
There are only four natural harbors on the whole California coast: San Francisco, Monterey, Eureka, and San Diego. An artificial harbor has been built at Los Angeles.

California is one of the two or three leading states in fish packing.

There are about 16,000 Indians in the state. They live principally on three reservations and support themselves by farming and basket-making.

The Chinese population has decreased from 75,000 in 1880 to about 27,000. There are nearly 72,000 Japanese, according to the 1920 Federal census.

How ALICE RODE to the GOLDEN GATE



DID you ever hear the old Greek story of Jason and his companions who sailed away in the good ship *Argo* to find the Golden Fleece? Many people think this is a story of the world-old hunt for gold mines, for almost every nation has some such story in its history.

Our own country's search for the Golden Fleece began with the discovery of gold in California in 1848. Many of your grandfathers can remember the exciting days when marvelous tales filtered through to the East of the great riches awaiting anyone brave enough to undertake the journey across the continent. Some of them were Jasons themselves and sailed away in "prairie schooners" in search of gold—not ships at all, these schooners, but large covered wagons drawn by horses and oxen, and the sea they sailed through was a sea of waving prairie grass.

California, as you know, lies 3,000 miles overland from New York City. Seventy years ago half of that area was unhabited by white people. A thousand miles of the way lay across trackless plains and over high mountains—a terrible journey. Still men's imaginations were fired with a desire for adventure and riches, and many risked the dangers from hardships and hostile Indians.

The Mad Rush for the Gold Fields

Fields were left half plowed, houses half built. Farms and shops were sold. In the East many hurried to New York to catch ships for the long sea route around Cape Horn, while others made up parties for the perilous overland voyage. Eighty thousand men, some women, and a few children really went to California by the overland route in the first summer after gold was found.

There were no trains across the mountains in 1849, and the journey over the Alleghenies was made by stage-coach. Upon reaching the Ohio River the gold seekers went by boat to the mouth of that stream and thence up the Mississippi to St. Louis, the most western city. There they bought their supplies—flour, bacon, and beans; blankets and clothing; guns and tools and water barrels. The next stage of the journey was also by boat, up the Missouri River, with wilderness on either side and here and there a small landing stage where the few white settlers gathered to greet them, and perhaps an Indian or two stared curiously. Kansas City was merely a wharf, called Westport Landing. At St. Joseph, then a little settlement, horses and mules were purchased and final preparations made for the trip across the country by wagon.

The Great Panorama the Children Saw

Before the travelers, when they were started on their overland way, stretched a beautiful rolling prairie, with only a few scattered settlements and

HOW THE IRON HORSE CLIMBS CALIFORNIA MOUNTAINS

That railroad up at the top of the picture doesn't seem to know where it really wants to go at all, does it? But the only way that railroads can climb very steep mountains is by weaving back and forth like that, following the line of the lowest grades. This is one of the things that interested Alice so much: "The iron horse climbed right over the mountains. The railroad looped around the curves and ran along the edges of cliffs and through snow-shed tunnels."

THE OVERLAND ROUTE IN EARLY DAYS

It would have been a lot more fun—for a little while—if Alice had traveled in a train like this, but she would have grown rather tired of it after a few hundred miles or so, don't you think? Yet it was in outfits like these that the first gold seekers who went overland had to make the long weary journey to the Land of the Golden Fleece. They just had to; there was nothing else for it, since there were no transcontinental railroads away back there in '49.

lonely cabins. Omaha was just a fort in the Indian country, and near it was a French fur-trading post. The fierce Sioux, the Omaha, and the Pawnee Indians roamed over the plains. Great herds of buffalo, antelope, and other game fed on its grasses and furnished meat for the gold-seekers. There were no trees except along the banks of the few wide rivers. But, oh, the flowers! Millions of them—red, blue, yellow, and white—starred the green or brown waving grass. The land climbed slowly for 500 miles until at the foot of the Rockies the plain was 5,000 feet above sea-level. The air was very pure and clear, and at a distance of 50 miles they could see the mountain peaks.

One morning the children climbed out of their beds in the covered wagons to see a wall of mountains, rising over a mile high above the plains. Forests partly covered their sides, with snow at the tops. It took days to cross these mountains, through high winding passes where brown, black, and grizzly bears and bighorn sheep were to be seen. In the plateau beyond the mountains were elk and deer, coyotes, and villages of prairie dogs. After that came mountains again, and then a wide burning desert.

Here and there in the desert was bunch grass for the horses and oxen, but most of the time there was nothing growing except sagebrush and thorny cactus. Little rivers trickled through deep gorges, but sometimes the water was bitter with soda, and some streams sank away in the sand. Coyotes howled at night and black buzzards circled the sky. There were rattlesnakes, too, and stinging scorpions.

Whenever water was found the barrels were filled and every drop was carefully used. After the hardships of the desert came another mountain range—the Sierra Nevada—from the top of which they looked down a steep slope, green with trees and bright with mountain brooks. At the bottom was a wide green valley and a river. Gold in the form of little grains and lumps or nuggets was mixed with the sand and gravel in the river beds.

THE HIGHEST SPOT IN THE UNITED STATES

That rugged peak you see in the background is Mount Whitney, the highest mountain in the United States outside of Alaska, rising 14,502 feet above sea level. It is situated near the southern end of the Sierra Nevada range, only about 60 miles from "Death Valley," the lowest point in the United States.

Mining camps sprang up all along the California streams. Red-shirted miners stood in the water beneath blue skies and the warm California sun, and scooped up pans full of gravel and sand, to wash out the gold. A few found a great deal of gold and became rich, but many found very little. Few people went home again, for the journey was too difficult. Besides, California developed many other kinds of wealth, so that today we call it the Wonderland of America.

THE OLDEST LIVING THING

This giant tree is the famous Sequoia called "General Sherman" in Sequoia National Park. Scientists have estimated that it may be more than 5,000 years old.

Alice never forgot the time she went to California with her grandfather, who many years before had gone in an ox-wagon when he was ten years old. Now he was going back from New York City in a palace car. Grandfather was over 70 and Alice was 10. She was young enough to be foolish, and grandfather was old enough to forget that he had ever been wise. So they went to California together and they had a wonderful time.

Part of the fun came from grandfather's pretending that everything would look as it did when he was a boy in the old mining days. He told Alice Chicago would be a little city of 20,000 people, and asked the colored porter of the car how big it was.

" 'Bout three million people, suh!"

"My, my, how it has grown since I was a boy," said grandfather. Alice laughed and grandfather's eyes twinkled. He pretended to be surprised all the time. Omaha was a big city, too. There was no fort, no fur-trading post, no Indians—there were no buffaloes, even. The grassy plains were covered with wheat and cornfields and busy towns. In front of the mountain wall was Denver, a city of more than 250,000.

THE GIRTH OF "GENERAL SHERMAN"

Thirty-six and a half feet—that's how big "General Sherman" is around the waist. And how tall do you think he is? Two hundred and eighty feet!

The iron horse climbed right over the mountains. The railroad looped around the curves and ran along the edges of cliffs and through snow-shed tunnels. "Now," said grandfather, "you'll see bears that *are* bears. Don't the bears come down to the stations and give you bear hugs sometimes?" he asked the porter.

The Menagerie that Moved Away

"No, suh, not that I evah noticed, suh. I reckon they done gone fah back in the mountains, suh!"

"Too bad, too bad," said grandfather. "No bears, no bighorn sheep, no deer, no elk. Well, hello! There are some prairie dogs, barking at the train!" There were a few Indians at the station, too, and flocks of woolly sheep on the mountain sides with shepherds and collie dogs, and in the valleys were cattle and cowboys on ponies. The snow peaks were there, and the dusty desert. But every once in a while they came to a mining camp high up on a shelf of rock, or a green valley with irrigation canals running through farms. The water had been brought down from the mountains to make the desert bloom. In the very dryest part of the desert they found Salt Lake City, with 100,000 people, in a big valley covered with farms and orchards between mountains. The city streets were shaded by great trees, the houses set in green lawns. As they crossed Great Salt Lake on a trestled track, they saw bathers bobbing about like corks. The water was so salt they could not sink. After a time the train climbed another steep mountain range, then slid down a long toboggan slope, through forests.

"Now," said grandfather, "I know where I am. I'll show you where I helped my father wash gold out of the gravel in the river bed. It's just below in the valley."

This time he wasn't pretending. He really thought he could find the place, but the mining camp was gone. Gold mining was now carried on largely in the mountains in deep mines which furnished the ore for mills that crushed the gold-bearing rock. The river banks were lined with towns and farms and golden wheat fields, and on the hillsides were flocks of sheep. The river grew wider as it met another river flowing north. These ran together and into wide water.

"Where are we going now?" asked Alice.

"Through the Golden Gate to where the sun sets."

There was a city of a half-million inhabitants, built up the hillsides above the water. At its feet lay a wide harbor full of ships. Across the harbor they looked through a narrow strip of water walled with rocks which looked like a thick stone gate, and through which they could see the sun setting in a great ocean. The city was called San Francisco and its nickname was the City of the Golden Gate. Alice wondered what lay out there over the wide water, and she hoped that some day she might go aboard a ship and go to see.

CALIFORNIA'S ENCHANTED VALLEY

Here we are in one of the most impressive sections of Yosemite National Park, of which John Muir wrote: "The noblest of forests, the loftiest granite domes, the deepest ice-sculptured canyons, the brightest crystalline pavements and snowy mountains soaring into the sky 12,000 and 13,000 feet, gardens on their sunny brows, avalanches thundering down their long white slopes, cataracts roaring gray and foaming in the crooked gorges!"

After they left the City of the Golden Gate they saw mountains two miles high, with lakes at the bottoms of their dark green pockets. They saw rivers sunk half a mile, and lined with steeples and towers of rock. Then they came to the Valley of Delight. Grandfather called it Yosemite Valley. There they left the train and got on a stage-coach. One whole day Alice rode on a donkey. They slept in a camp hotel. The valley was a mile deep, walled with mountains. Rivers fell from the tops of the cliffs, tumbling after each other like Jack and Jill. One of them jumped down a cliff a quarter of a mile and found it such fun that it took a little run over the rocks and jumped again, playing hide-and-seek and follow-the-leader and leap-frog down the rocks. Sometimes a falling brook spread out in a broad sheet, and sometimes it fell so far that it turned to spray and looked like a bride's long veil. The sun turned the spray to rainbows.

Alice had no time to catch her breath before the next wonder—trees more than 300 feet high and 30 feet thick. She had to lie on her back to see the tops of them. They looked very very old, and she thought they must have been born in the days when giants lived.

"Were they here when Columbus came to America?" Alice asked.

"Oh, yes, wise men think some of them might have been 5,000 years old when Columbus came."

Dear, dear! Alice wondered if they weren't tired standing and holding the blue sky up so long. Little white clouds seemed to be tangled in their evergreen leaves.

The farther south they went the warmer and dryer it became. Still there were wheat fields and sheep, and by and by there were orchards of gray-green olive trees, and vineyards of big white grapes on gravelly hillsides. Some of the farms had queer houses of sun-dried yellow bricks, and with flat roofs. Many of the people were dark in complexion, with big black eyes. Almost every town and river was called "San" or "Santa" something, which grandfather said was Spanish for "Saint."

How did Spanish people ever get away over into Southern California? Alice asked a sheep rancher that, as she drank milk and ate figs as sweet as honey in the *patio*, or inner court, of his house. He took off his broad-brimmed, gold-laced, pointed hat very politely and said that he did not know. They had been there a long time. Then she asked a priest at an Indian mission church. He said the Spanish people came up from Mexico to live, many many years before gold was found in California. They brought seeds and plants from Mexico and coaxed water down from the mountains, and made a garden out of the desert. Many of the gold seekers of '49 did not go back home, but went down the valley 500 miles to the old Spanish towns. There they established farms and towns near the sea around Los Angeles. The Spanish had built a town there of sun-dried bricks, and called it the City of the Queen of the Angels. Now it was a great rich American city with nearly 600,000 inhabitants.

Right above the city of Los Angeles were snow-covered mountains with real Christmas trees growing on their slopes. On New Year's Day there was a flower festival. Hundreds of carriages and automobiles went in procession, covered with roses, and flower-fairies rode in open cars. Alice was a white orange blossom in a bride's wreath of little girls.

Alice was so happy she couldn't sleep a wink that night, and wished she might live in the City of Angels forever.

CALIFORNIA, LOWER. The name California, the origin of which is disputed, was given first to this peninsula (also called Old California) and later extended to the region northward. It is a territory of the republic of Mexico and is separated from the rest of the land by the Gulf of California and the Colorado River. It is 750 miles long by 30 to 150 broad. Its area is a little more than a third that of the state of California. Its capital, La Paz, in the extreme south on the gulf side, has a population of about 5,000. The surface of the country is mostly mountainous. The climate is hot and dry, especially in the northern part, and little farming is carried on there except in some of the valleys. The south, however, has more rain and some fertile tracts, with a mild and pleasant climate. By means of irrigation, grapes, grains, tobacco, cotton, and sugar cane are raised. Whale fishing on the west coast and pearl fishing on the gulf are carried on to some extent. The country is rich in gold, silver, copper, lead, coal, salt, and other mineral deposits, but mining enterprises have met with little success. The extension of the California railway system southward into the peninsula, since 1907, holds out prospects of more rapid development. La Paz has a good harbor, while the excellence of Magdalena Bay, on the Pacific side, has caused it to be coveted by foreign powers for a naval station.

The coast of Lower California was explored by orders of Cortez, the conqueror of Mexico, in 1539. The first permanent settlements, dating from 1697, were made by the Jesuits, who were active in mission work among the Indians.

CALORY. A unit used to measure heat. The *greater* calory is the amount of heat required to raise one *kilogram* of water one degree Centigrade in temperature. The *lesser* calory is the amount of heat required to raise one *gram* of water one degree Centigrade. (*See* Food; Heat.)

CAL'VIN, JOHN (1509–1564). One hot July evening in the year 1536 three weary travelers appeared on the streets of Geneva, in what is now Switzerland. They intended to pass the night in one of the inns of the town and to proceed the next morning on their way to Strasbourg. But when Farel, the reforming minister of Geneva, heard that John Calvin was one of the party, he hurried to the inn and persuaded Calvin to stay in Geneva and assist in forming a state which should be governed according to the Word of God.

Calvin had been obliged to flee from his home in France because he had turned against the Catholic church. Geneva was a good place for him to come to, because it had accepted the teachings of the Reformation. It had won at the same time its independence from its feudal ruler and was a self-governing city republic. Therefore Calvin could put in practice in it his ideas of a perfect state—ideas which had been formed during his years of study in some of the best universities of France.

Geneva came to be known as the "City of Calvin" and the "Protestant Rome." The life of the people, as regulated by Calvin's church, reminds us of the lives of the Puritans in Massachusetts. Everyone was required to go to church on Sunday or suffer severe penalties. A man who swore "without necessity" was required to take off his hat, "kneel down in the place of his offense, clasp his hands, and kiss the earth." Silk dresses or hosiery, jewelry, and other adornments were forbidden. A hairdresser was once imprisoned because he made one of his patrons too beautiful. And a child was beheaded for striking its parents. The greatest blot on Calvin's fame is his part in the burning of Servetus, a religious teacher who denied the doctrine of the Trinity.

Calvin's teachings are the basis of what we know as the Presbyterian church. They spread among the Huguenots of France, the Protestants of the Netherlands and Scotland, and the Puritans of England. By the Puritans they were brought to America, and the practice of allowing the people to elect their own officers was followed in the state as well as in the church. And so it may be said that the United States owes something of the democracy which it enjoys today to this stern old Puritan of French-speaking Geneva, over three centuries ago.

CAMBRIDGE, MASS. Although it has become one of the most important manufacturing cities of New England, the chief fame of this suburb of Boston, separated from it by the Charles River, is as an educational and literary center. Old Cambridge, the southwest portion, on which the original town was laid out, is the attractive residential section and the seat of most of the educational institutions. Brattle Street is one of the beautiful residential streets of New England.

Newton, as the city was originally called, was founded in 1630 by Governor Winthrop with the intention of making it the capital of the colony, but this plan was abandoned. It was soon named Cambridge, as most of the chief settlers were graduates of Cambridge University, England. The tax for wooden palisades around the town in 1632 led the Watertown precinct to make the first protest in America against taxation without representation. The Bay Psalm Book, the first book to be printed in the United States, was printed here. At the opening of the Revolution Cambridge was the headquarters of the colonial army, and remained such until the British abandoned Boston. Until after the Civil War Cambridge was the center of American cultural life.

In Cambridge are located Harvard University, the oldest college in the country (founded 1636), Radcliffe College for women, the Massachusetts Institute of Technology, and Andover Theological Seminary, as well as other less famous schools. The public school system and the city government are among the best in the country. In Old Cambridge is the famous Washington Elm, under which Washington is said to have taken command of the American army, July 3, 1775. Near by is the Craigie House in which Washington had his headquarters, and which later became the poet Longfellow's home. The poet Lowell was born and lived most of his life at "Elmwood" in Cambridge. Other noted men who lived here are Oliver Wendell Holmes, W. H. Channing, the two Agassizes, and John Fiske. Population, about 110,000.

The FOUR-FOOTED "SHIP *of the* DESERT"

TO THE children of the western world the camel is as strange and interesting as many of the fiercest wild animals. He tells you very little about himself, and he shows no curiosity about the crowds that visit him at the Zoo. He gazes over people's heads in a dreamy way, like the old stone sphinx head that stares across the desert in Egypt. A bright little boy once said: "A camel is a great big ugly puzzle." Let us see if we can work out a little of this living puzzle.

CAMEL. Everything about a camel is as queer as if you had dreamed him in a nightmare. His neck and legs look too long and sprawling for his body. His feet are each split into two hoofed toes almost up to the ankle. His head is small and ugly and, as Kipling says, bobs around "like a basketful of snakes." His brown eyes fairly pop out of his head like agate marbles, from sockets too small for them. His nostrils are bias slits. He can open them wide, or close them almost shut during the terrible sand storms of his native deserts. His rough hair looks as if it never had been combed. On his knobby knees and arched breast-bone he wears tough leathery pads like a football player. Finally, his hump makes him look as if he "had his back up" against an unfriendly world.

Don't go too near a camel's head. Sometimes, for no cause at all, he has a terrible fit of rage. Then he tries to bite and to kick the person nearest. One of the first things you will notice is the queer way in which he chews his food. His lower jaw swings from side to side like a hammock. His upper lip is cleft up the middle like a hare-lip. The camel reaches for and feels its food with this thick split lip as if it were made up of two fingers.

And His Disposition is Just as Odd!

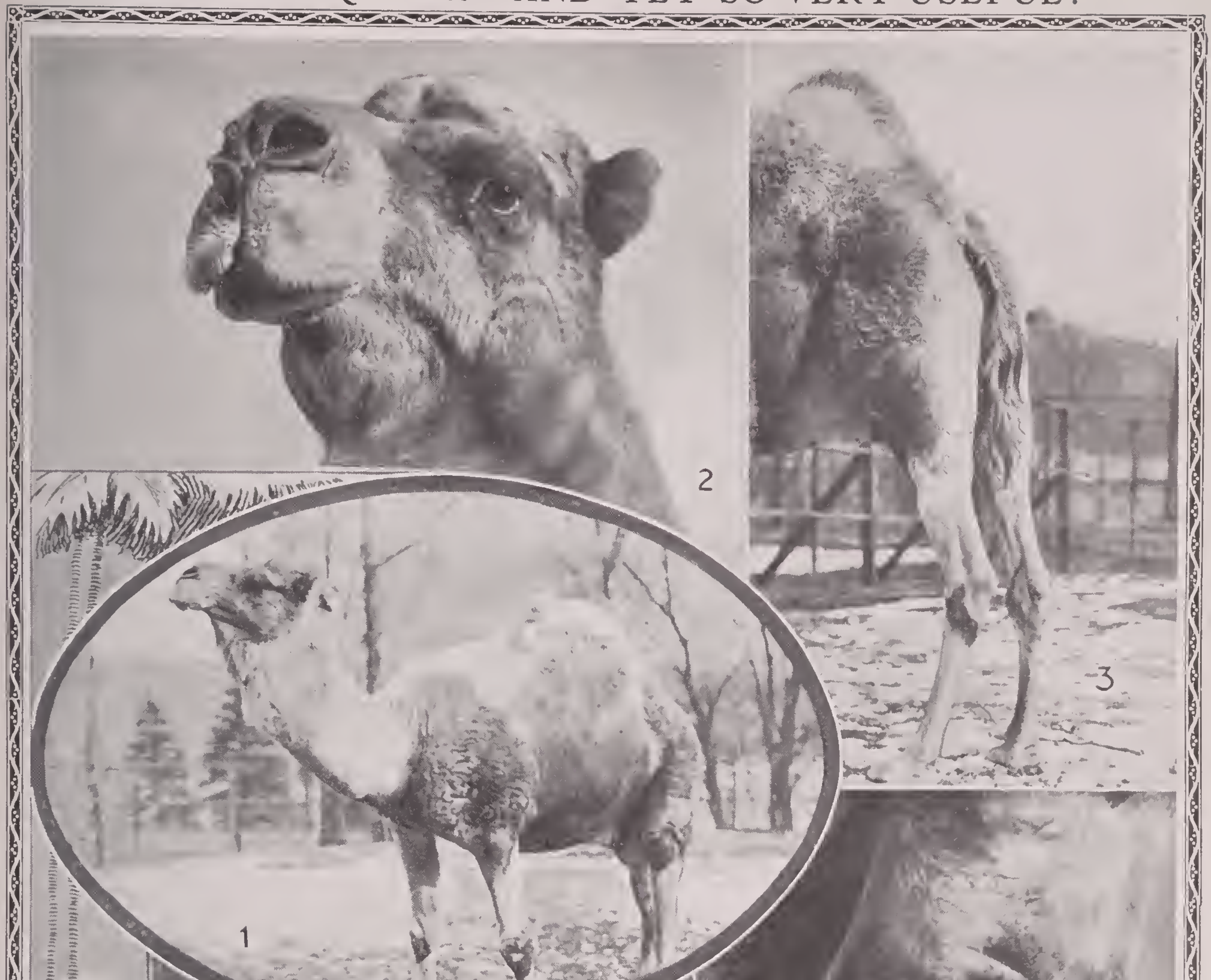
For many hundreds of years the camel has been one of the most useful animals to men, because of his great strength and his ability to endure heat, thirst, and hunger. But he is a very stupid beast and has never learned to do more than a few simple things. He never seems to know or to care for his driver, who may have brought him up from a baby. He has as little sense as a sheep, is as ill-tempered as an angry bull, and as stubborn as a mule. He works, but not willingly as a horse does.

One of the few things the camel has learned to do is to kneel when he is ordered to do so. His kneepads protect his joints from the hard ground, but he moans and groans as if in terrible pain. He knows some kind of a load is to be put on, and complains aloud. He doesn't wait to find out whether the load is to be heavy or light. He carries with ease a quarter of a ton of goods for hundreds of miles across wide deserts. But he groans just as loud when he is asked to carry two little children about the zoo. With more groans he heaves his big body up and starts to walk; or rather to rock.

Why the "Ship of the Desert" Makes You Seasick

If you get seasick easily you had better not try to ride a camel. He lifts both feet on one side at the same time, tilting his body sideways. Then he lifts the two feet on the other side. So you must roll over and back. Tossing and pitching, heaving and rolling, you feel as though you were in a sailboat on rough water. So violent is the motion that the camel-police

SO VERY QUEER—AND YET SO VERY USEFUL!



"Everything about the camel is as queer as if you had dreamed it in a nightmare. His neck (1) and legs look too long and sprawly for his body. His feet (4) are split into two hoof toes almost up to the ankle. His brown eyes fairly pop out of his head like agate marbles from sockets too small for them. His nostrils are biased slits (2) and his rough hair looks as if it had never been combed. On his knobby knees (5) and arched breast-bone he wears tough leather pads like a football player. Finally his hump (3) makes him look as if he had his back up against an unfriendly world."

of Egypt, who often ride day and night over the desert on racing camels in pursuit of smugglers, are compelled to bind their bodies tightly with long strips of cloth. An American writer described camel-riding in these words: "Set a section of twelve-rail fence at an angle of 45 degrees in a farm wagon, straddle this and have the whole outfit, yourself included, run away with over a rocky New England blueberry pasture, and you will form a mild conception of the sensation of riding a baggage camel in the Sahara."

Maybe you think this is why the camel is called the "ship of the desert." But it isn't. It is because he carries people and merchandise across wide seas of shifting sand.

JUST IN FROM MANCHURIA

The caravan has just reached the walls of Peking, bringing baskets of fruit. And here are two of the shaggy double-humped camels that take the place of railway cars in those distant lands. That boy driver was probably brought up with his camel and can make him mind where a stranger would be bitten and kicked.

Haven't you heard people say, "Handsome is as handsome does"? If you could see the camel at home where he "does handsomely" you would forget what an ugly ungainly beast he is. You would think how wonderfully he is made for the work he has to do. No other animal can live and carry great burdens in such a climate, on such scant supplies of food and water.

The Camel's Dainty Appetite

For food, after a day's travel, a camel is given a small measure of hard dates or dry beans. Besides, he crops the twigs, thistles, and thorny shrubs that grow here and there in the desert. Camels will eat anything. They will chew their own leather bridles or tent cloth, and they consider an old mat or basket a great delicacy. One witty writer has said that a camel can make a breakfast from a Sunday newspaper and an old umbrella. And their digestion is so good that even poison affects them very little. Moreover, the camel's big solid hump is his pantry shelf full of fat, to be drawn upon when food is scarce, and his stomach is a honey-comb of little cells for storing water, so that he can go a week between drinks in case of need.

In the hot dry desert regions the camel is the horse, the cow, and the sheep of the herders and traders. He carries all the burdens, he furnishes flesh and milk for food, and his hair or wool furnishes material for weaving cloth. At night in camp the little children of the chief drink cups of the camel's thick cheesy milk, mixed with water. On the chief's table is cooked camel flesh. The herders wear robes and turbans of brown camel's-hair cloth. The master sleeps under a camel's-hair tent. Without this ugly, stupid, useful beast, the hot deserts of the Old World would lie unpeopled and unknown. But the camel knows nothing of his value and cares less. Like the desert itself, he submits to be used but remains untamed, sullen, and forbidding.

There is just one thing for which the camel has a soft feeling. The mother camel shows affection for her baby. Although the baby camel is three feet high, and heavier than a calf when he is born, he is so weak and wobbly on his legs that he can scarcely walk. Without his mother's milk he would die. The mother perhaps has to go with the caravan of hundreds of other camels, traveling 25 or more miles a day across the burning sand and rocky hills. Then the helpless baby is put into a hammock, and swung from one side of the big freight camel. The nurse may carry a quarter of a ton of other things besides—leather bags of water, bales of cloth and dates, jugs of oil, and blocks of rock salt. All day long the nurse swings along at a rocking gait. The baby must feel much as a human baby feels when rocked in a cradle.

There is a curious reason why the baby isn't put on his mother's back. Camels are so stupid that if the mother could not see her baby, even if it were on her own back, she would be apt to think he had been left behind. Then she might turn and bolt for the last camping place. On the nurse-camel she can see him, and she follows contentedly. After the day's march she has him all to herself. She nurses him, she nuzzles him with her sensitive hare-lip. He cuddles up to her for warmth, for after the terrible heat of the day the nights on the desert are often cold. But it is very still and clear. She can feast her eyes on her baby, for the dark blue velvet dome of the sky is hung all over with little golden lamps of stars.

Various Members of the Camel Family

There are two kinds of camels—the *Arabian*, or single-humped camel of Arabia, Syria, and Africa; and the *Bactrian camel* with two humps, of western

Asia. The feet of both are provided with spongy pads which spread somewhat as the animal walks on the yielding sand. The hair of the Arabian camel is sandy in color, that of the Bactrian camel reddish-brown or black. A baggage camel is expected to carry 500 or 600 pounds and travel 25 miles a day; while a trained riding camel or "dromedary" can go from 50 to 75 miles a day.

There are no records of wild camels, so domestication must have been accomplished early. In the Bible we read that Abraham took on his journey "sheep and oxen and camels." Job had at one time 6,000, and the Amalekites possessed "camels without number as the sands by the seashore for multitude." In modern times some Arabian and African tribes own hundreds of thousands of these animals. Before the railroad from Cairo to Suez was opened, 600 camels a day were employed for transportation purposes between these two places. The free camels which roam the wastes of northern Turkestan and are hunted for their flesh, hides, and wool are descended from a few domesticated ones which survived the terrible sand storms that overwhelmed the villages of the Gobi plateau 200 years ago. About 1857 the United States army tried to introduce the camel into the deserts of Arizona and New Mexico but with little success.

Scientific name of Arabian camel, *Camelus arabicus;* of the Bactrian camel, *Camelus bactrianus.*

The llamas, alpacas, and vicuñas of South America belong to the same family as the camels, but are smaller in size and differ greatly from them in structure and habits.

Camellia. Everyone will acknowledge that the camellia, or "rose of Japan," is one of the loveliest flowers ever introduced into this country; but unlike our European rose, which it so much resembles, it has no fragrance. It grows upon an evergreen shrub or tree with thick dark shining leaves, and in its wild state has red flowers like those of our wild rose. Most of the cultivated forms are double or triple, and vary in color from yellow and white to pink and deep red. The camellia is a native of China, India, and Japan, and was introduced to Europe in the 17th century by a Jesuit monk, Joseph Kamel, from whose name the latinized word camellia is derived. It is now extensively cultivated in greenhouses in Europe and the United States, and in some places in the South the bushes grow luxuriantly in the open ground.

The camellia belongs to the same family as the tea-plant—*Ternstroemiaceae.* There are about ten species. The seeds of some kinds are rich in oil, which forms an article of commerce in the Orient.

Cameo. An engraved gem or sea shell bearing a design cut in relief is called a *cameo,* as distinguished from an *intaglio,* in which the engraved object is hollowed below the surface. Cameos are most frequently made from gems composed of two or more layers of different colors. The figures are cut in relief upon one of the upper layers of color, and the under layers form the background. The stones most used are agates, onyx, sardonyx, and chalcedony. Cameos have been used not only for personal jewelry but for adorning cups, vases, and even furniture. A great number of cameos of the Egyptians, Greeks, and Romans are preserved in museums.

Camera. If you darken a room on a bright day and admit no light except through a very small hole in the window shutter, an inverted picture of the objects in front of the hole will be formed on the back wall of the room, or on a white screen placed nearer the window. This is the simplest form of the *camera obscura,* which means in Italian "dark chamber"; it was used several centuries ago for observing eclipses. A smaller camera obscura may be made by constructing a small box, with a pin-hole in one side.

If a lens be put in the aperture, a much clearer and sharper image will be formed. If this image is allowed to fall on a plate or film covered with chemicals sensitive to the action of light, and the plate or film is properly developed and "fixed" by other chemicals, a permanent picture is obtained, and the camera obscura becomes a photographic camera (*see* Photography). The image is more or less distinct according to its distance from the lens, and so it is necessary in cameras for fine work to move the lens nearer to or farther from the back wall of the camera. This is done by making the sides of folding leather, and such cameras are called bellows cameras.

If a mirror is put at an angle of 45 degrees inside a camera obscura, an image of the objects before the lens will be formed, right side up, on a piece of ground glass put above the mirror. The viewfinder, with which many photographic cameras are provided, is just a very thin camera obscura of this sort. The periscope, so important in submarine and trench warfare, is a camera obscura arranged to reflect downwards (*see* Lens; Periscope).

Camouflage. In the World War of 1914–18 the old art of disguise in warfare was raised to a science and given the new French name, "camouflage." Under the new conditions of airplane scouting it became of supreme importance to conceal trenches, fortifications, guns, "snipers," and observation posts. Sometimes this was done by piling branches on the object to be concealed. Sometimes it was covered with canvas painted to resemble a natural object. At times "faked" fortifications and batteries of "Quaker" (make-believe) guns were constructed to direct attention away from the real fortifications and guns. Screens of dense black smoke were often created to conceal the advance of troops or the operation of ships.

Often the principles of "protective coloring" found in the animal world were used, and guns, automobiles, freight trains, and the like were painted in zigzag bands or blotches of light and shade, to break up the sharp outlines of the object. Disguise of this sort was applied especially to ships, not so much with a view to rendering them invisible as to make the aim of an attacking submarine uncertain.

WORK *and* PLAY *of the* CAMP FIRE GIRLS

CAMP FIRE GIRLS. "Wo—he—lo—!" Do you know the call? Have you ever, answering from wood or meadow, in sandaled feet, slipped through some grassy path, and with the mystic sign of the fire, been admitted to the brown-robed bead-banded circle? If you have, you are a Camp Fire girl; if you have not, this shall be your introduction to that happy band.

First, you will learn that *Wo-he-lo* means *Work, Health, Love,* the first two letters of each word being joined to make the Camp Fire call. You will see how each of these words is a torch that kindles the camp fire, which symbolizes the hearth fire of the home each girl will sometime make; and then with the others of the charmed circle you will stretch your hands above the flame as you sing—

Whose hand above this blaze is lifted,
Shall be with magic touch engifted,
To warm the hearts of weary mortals,
Burn, fire! Burn!

As the beautiful rites progress, you will place your hand in the welcoming hand of the guardian, while you express your desire to follow the law of the fire:

Seek Beauty,
Give Service,
Pursue Knowledge,
Be Trustworthy,
Hold on to Health,
Glorify Work,
Be Happy.

A Camp Fire Girl

You will want to be a Wood-Gatherer, the first rank a Camp Fire girl may attain, so you will choose your Indian name and a symbol to express its meaning. Suppose you choose "Mondamin," which is the word for corn, and means "the friend of man." Then your symbol, a golden corn-ear, will be worked into your bead band, and embroidered on the ceremonial gown which each Wood-Gatherer must make before she may wear the silver fagot ring. This ring is the token that the wearer has earned ten honors from the long and varied list of Home-craft, Health-craft, Camp-craft, Hand-craft, Nature-lore, Business, or Patriotism honors. You will earn 50 cents to pay your annual dues, and then, at the ceremonial meeting, in your new ceremonial gown, you will stand and repeat the Wood-Gatherer's desire to be loyal to your Camp Fire sisters, to—

Be true to the truth that is in me
And pure in my deepest desire.

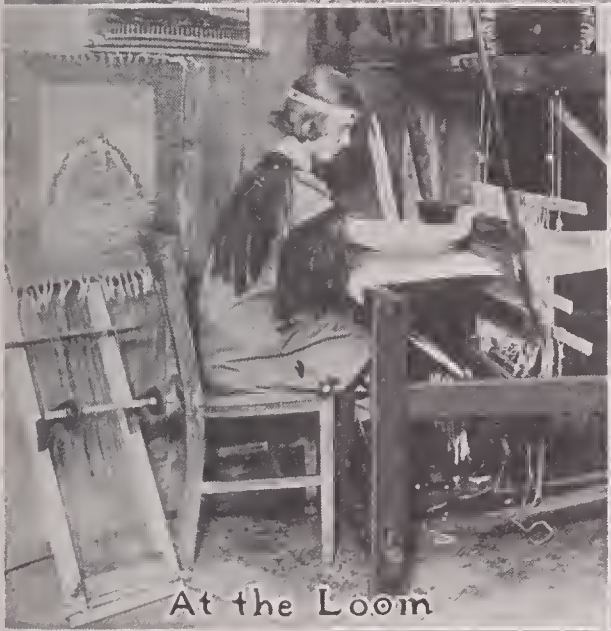
Then the guardian, a woman who has been chosen by the girls because she understands their "deepest desires" and can share in all their activities as one of themselves, will award the honor beads. If one of your elective honors belonged to the Home-craft class, you will receive a flame-colored bead, and a red one for Health-craft, or blue for Nature-lore—for each class has its distinctive bead. And with the beads that go with the Wood-Gatherer's rank, the coveted bead necklace with all its significance of accomplishment will begin to be a reality, and will grow—a bead at a time—with each honor won.

When you are 13 years old you will be ready to work for the rank of Fire-Maker. For this you must earn 20 elective honors and 14 required honors. You are now older, and the responsibility of the required honors only adds to the zest of earning the royal purple beads, awarded for such accomplishments as: "To know the principles of elementary bandaging, and how to use a surgeon's plaster; to keep a written classified account of all money received and spent for at least one month; to mend a pair of stockings, a knitted under-garment, and make a hem at least one yard in length; and to know and sing all the words of the National Anthem." Not so difficult, is it?

WHO WOULDN'T BE A CAMP FIRE GIRL?

Setting up the Tent

The Camp Fire Song


At the Loom

Ready for Inspection

Helping in the Home

For Feathered Friends

This group of pictures illustrates only a few of the endless interests and activities of the life of a Camp Fire Girl. The first picture shows what a trick it is to set up a tent when the wind is blowing. The girl in the Indian costume shown in the next picture below is making a blanket on much the same kind of a loom as the Indians use. Helping with the ironing, as this girl at the right is doing, is one of the ways to earn honors in home-craft.

In the scene at the top the camp fire symbolizes the hearth fire of the home, and these girls are singing the campfire song, with their hands held out toward the flame. Below is an early morning scene in camp. The tent is all tidied up, the cot beds are made, and the girls are waiting for inspection by the camp councilors. The bottom picture shows a Camp Fire Girl ready to put a bird house in a tree — for kindness to animals is one of the things the girls learn.

This rank requires the expression of the Fire-Maker's Desire:—

As fuel is brought to the fire,
So I purpose to bring
My strength,
My ambition,
My heart's desire,
My joy,
And my sorrow
To the fire of humankind;
For I will tend,
As my fathers have tended,
And my father's fathers,
Since time began,
The fire that is called
The love of man for man,
The love of man for God.

When you are 15 years old, if your guardian has found you worthy of leadership and you have won certain required honors, you may take the rank of Torch-Bearer, with the expression of the desire to "bear the torch of life and light to guide others." With this rank will come the happy privilege of helping the guardian with the Nest of Blue Birds, little girls between 6 and 12 years old, which may be connected with each Camp Fire.

All through these years, along with the earning of the ranks, there have been hikes, nights under the stars, camping trips with songs and stories, winter sports, parties, and entertainments—all the things that girls love to do together. And, best of all, if you have been a loyal Camp Fire girl you will have found your everyday life filled with beauty and happiness, thus realizing the dream of Dr. and Mrs. Gulick, who for the sake of their own daughters conceived the Camp Fire ideals, and through ritual and symbolism made them a magic that has reached around the whole world and touched the lives of tens of thousands of girls in many nations. Any group of girls over 12 years of age may form a local Camp Fire, by conforming to the simple requirements set forth in the Camp Fire manual which may be obtained from the national headquarters in New York City.

CAMPHOR. The familiar vegetable substance known as "gum" camphor—or in an alcohol solution as "spirits" of camphor—is the product of a tree native only to Formosa, Japan, and central China, called the camphor laurel tree (*Cinnamomum camphora*). The Japanese government retains a monopoly of the production and refining of camphor in Formosa and Japan. Most of the world's supply of camphor comes from the Formosa forests.

Eighty-five per cent of the camphor imports to the United States are used in the manufacture of celluloid, and the remainder is used medicinally or to protect furs and woolens from moths. During the World War the United States government bought immense quantities to be used largely in treating "trench feet," that is, the inflamed feet of soldiers in the trenches.

Camphor is obtained by distilling the leaves, bark, and chips of the camphor laurel with steam. This distillate is warmed and the water and volatile oils go off, leaving a residue of impure camphor. This gum is carefully sublimed. (A substance that will, when heated, pass into a vapor directly from a solid state is said to "sublime.") As the vapor cools, crystals of camphor are deposited.

Camphor gum will sublime, or, as one might say, evaporate at ordinary temperature, as anyone knows who has tried to keep camphor gum, even wrapped in paper. It dissolves readily in alcohol and ether. Synthetic or artificial camphor, which was formerly prepared from turpentine, is no longer manufactured because of the high cost of turpentine.

The LORE and LURE of CAMPING

WAS there ever a live, normal, wide-awake boy or girl who didn't just naturally sit up and listen when somebody said, "Let's go camping"? Just the word "camping" gives you a thrill, sets you dreaming of sizzling bacon and the clean whiff of pine boughs. It carries with it the lure of untrodden forest trails, the romance of the evening campfire, the mysterious adventures of night in the woodland full of strange spicy odors and faint entrancing noises.

CAMPING. There are camps and camps. There is the elaborate expensive all-summer camp, run under the direction of trained councilors. There are vacation-school camps, Boy Scout camps, farm camps. There is the overnight camp, when you are on a canoeing or walking trip and pitch tent as you go along; and there are the week-end camps, or longer vacation camps, when with a small congenial company you get away from school or work to be really alive for a few delightful hours. But whatever the kind of camp, and however varied its setting and equipment, certain factors are indispensable—the outdoors and plenty of it, experienced leaders, good and bountiful food, adequate shelter, and last but by no means least a pervading atmosphere of good comradeship.

The large camps, like those of the official Boy Scouts of America, the Camp Fire Girls, and those run for profit, need little discussion here. They are the outcome of years of experience, and depend for their success upon leadership, organization, and equipment rather than upon the camper's own knowledge of the arts and crafts of camping. Such camps are usually located in Nature's beauty spots. They are in charge of men and women who know and like young folk. No boy or girl can spend a summer under these conditions without emerging fitter all around—physically and mentally. Organized camp life is an education in itself and one of the best.

THE "PUP" TENT IN THE WOODS

These two chaps have just set up their "pup" tent, and they will both be sleeping under it tonight as snug as you please. Hanging from the top is their ax and other camp gear.

For the small camp, where most boys get their camping experience, a few suggestions may aid in making the camp a success. Right at the start we must drive home the essential point that no serious camping should ever be undertaken without suitable leadership. There should be at least one grown-up in every camping party. "What, take a grown-up along?" somebody exclaims. "That will spoil all the fun." Not at all. Choose your grown-up with care—somebody who knows and likes boys as he knows and likes the out-of-doors. Choose one who can hike and swim with the best of you, and if possible one who knows the woods and their inhabitants from long experience. Emergencies will arise which call for more than a boy's wits and experience. The lamentable death toll among boys every year from drowning alone gives evidence of the risks of undirected outdoor sports. Also, somebody has to be "boss." Every boy who has rowed in a race, played baseball or football, or made one of an orchestra, knows that coöperation and good will are not enough. Where everybody is boss, nobody is boss, and the broth is spoiled by too many cooks. And it is easier for a grown-up than for a boy, no matter what tact and skill at leadership the boy possesses, to command other boys. So, take your grown-up along, not as "excess baggage" but as a captain.

The Importance of the Site

In the next place choose your camp site as carefully as you choose your grown-up. Select a dry level open location, preferably on a slight elevation so that water will readily drain off in case of rain. Consider wood and water supply. The wood must be the kind that will burn and that you have a right to burn. No good camper will be a trespasser. The drinking water must be pure. Typhoid germs are far too dangerous to admit them into your system. You have heard of that trite old "ounce of prevention." There was never a better place to apply it than in considering your camp site.

Here are a few more points to bear in mind. Sandy soil will not hold tent pegs; neither will loam or clay, when wet. Therefore choose gravelly soil, if possible, through which surface water will percolate readily. Don't pitch tent in a ravine or a depression, unless you wish to feel as if you were in the front line trenches when rainy weather sets in. Choose an easterly or southerly exposure and one that is open to the sun for the better part of the day.

Camp sanitation is of the utmost importance. One of the first tasks is to provide a latrine at a sufficient distance from camp to prevent odors from filtering back and also to prevent any possibility of corrupting the water supply. A pit should always be dug and the deposit covered immediately by loose earth or, better still, by leaf-mold. Air-slaked lime should be applied daily, if possible.

Camp garbage should be burned or buried. If refuse is buried, the pit should be sufficiently deep and the deposit so thoroughly covered with earth that it will not be an invitation to the ever-present disease-carrying flies.

You'd Better Take a Tent

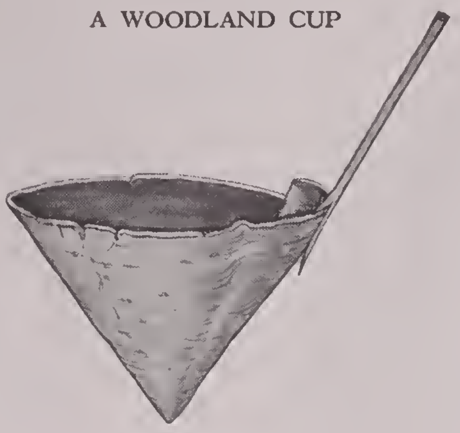
Now for the tent! Of course no real camper is afraid to roll himself in his blanket and go to sleep with nothing between him and the stars. Everybody should have the experience of a roofless night at least once; but for continuous camping, open to variations of weather, a tent is not to be despised. It isn't necessary to court discomfort in order to be a true camper. Rather, the true camper is the one who knows how to make himself comfortable under any conditions.

The subject of tents is too extensive to be treated fully here. You will find interesting and full discussions in chapter iv of 'The Boy's Camp Book', by Edward Cave; in the chapter on campcraft in 'The Boy Scout Handbook', which every boy, whether scout or not, will find interesting; in Dan Beard's various books on camping; in the chapter on camp equipment in H. W. Gibson's 'Camping for Boys'; in Horace Kephart's book on 'Camping'; and other reputable sources.

If more than three are to sleep together, the wall tent is preferable; but for two or three occupants the "A" or "pup" tent is thoroughly satisfactory. In the pamphlet on 'Camping' issued by the Boy Scouts of America, this type of tent is described.

A serviceable tent for two persons (and large enough for three) is the 7½ by 9 foot size, with an inside sod cloth nine inches wide. Some experienced campers substitute for the front supporting pole two cut poles locked together at their tops by crotches in which the ridge pole will rest, and spread at about the angle of the tent front. This leaves the door space entirely open when the flaps are thrown back, and makes easier draping over this space bobbinet to keep out mosquitoes and other pests in their season. In fact, your experienced camper is likely to leave behind all ready-made tent poles and pegs, which he contends there is no point in lugging around, unless the camping is to be done in a treeless country.

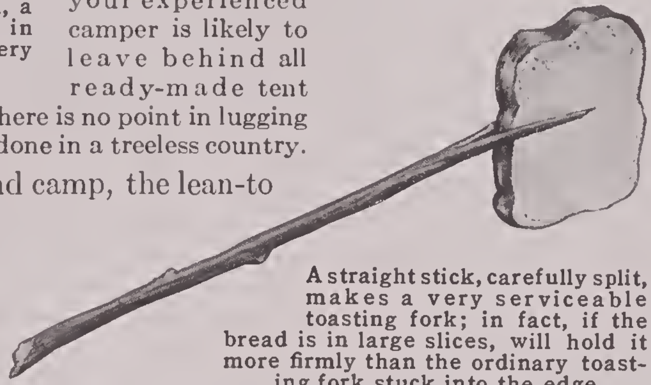
A WOODLAND CUP



For dipping water from the spring and for various uses in the camp kitchen, a dipper can be made from birch bark in this way. It will answer nearly every purpose of a tin cup.

For the one-night or week-end camp, the lean-to makes a satisfactory shelter. A thick layer of hemlock or balsam boughs may be spread on the floor of the lean-to, convex side up, butts where your feet are to rest—that is, toward the entrance. A poncho spread rubber side down on this foundation, and you in your sleeping blanket on top, and all is well on your "browse bed."

A TOASTING FORK



A straight stick, carefully split, makes a very serviceable toasting fork; in fact, if the bread is in large slices, will hold it more firmly than the ordinary toasting fork stuck into the edge.

Take Woolen, Not Cotton, Blankets

Don't make the mistake of carrying cotton blankets. Weather in the United States has infinite variety, and a good camper is prepared for anything. Cotton absorbs dampness and in wet weather is likely to become an exceedingly moist and unpleasant bed-fellow. Also, safety first! A careless application of a lighted match to a woolen blanket will do little damage. The same match meeting a cotton blanket is likely to start a merry little conflagration. A soft loosely woven woolen blanket is warmer for its weight than a closely woven one, though the latter has greater durability. The color should be dark or neutral.

Horace Kephart, one of our great camping experts, tells how to roll up in a blanket and stay rolled up:

> Lie down and draw the blanket over you like a coverlet, lift the legs without bending at the knee, and tuck in first one edge smoothly under your legs, then the other. Lift your hips and do the same there. Fold the far end under your feet. Then wrap the free edges similarly around your shoulders, one under the other. You will learn to do this without bunching and you will find yourself in a sort of cocoon.

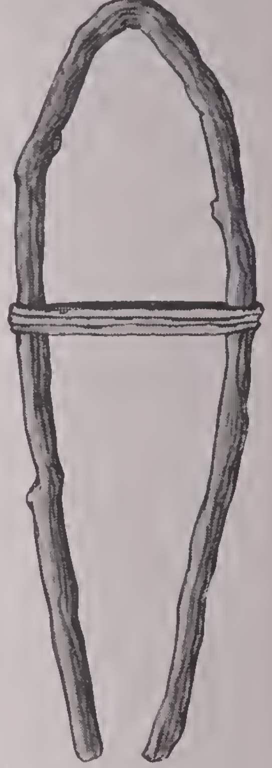
Some campers like sleeping bags; others abhor them. If used, the cover should be waterproof, the inner layers removable. It goes without saying that a sleeping bag whose blankets and linings cannot be quickly removed and spread out to dry and air is an abomination and a menace to health.

For a camp which is to be occupied for a fortnight or so there is no good reason why the campers should not supply themselves with cots. The canvas stretcher type with compactly folding framework is better than the heavier wire-bottom kind. For cold weather the cot should be fairly wide; on a narrow canvas cot the sleeper's weight depresses the canvas sufficiently to make air spaces between his body and the side of the cot, and the draughts playing through these spaces will keep him more or less cold. On a wider cot the blanket may be made to meet the canvas close to the sleeper's body. But in cold weather it is difficult to keep warm on any cot without a mattress, unless one uses a heavy sleeping bag.

Every camper should have a "ditty kit"—that is, a small case containing toilet articles (comb and brush, tooth paste, etc.), sewing outfit, writing pad, and such other miscellaneous articles as seem indispensable.

"Duffle bags" reduce the transportation problem to lowest terms. A "duffle bag" is a large sack made of heavy waterproofed canvas, with handles on bottom and side; 18 by 36 inches is a good size. One bag will serve for three or four boys, and will cost about $2. It holds an amazing number of articles, and thus eliminates the inconvenient array of suitcases and hand-bags which afflict some camps.

A PAIR OF TONGS



A piece of springy wood, bound with a leather thong or with string makes a very serviceable pair of tongs.

Every camp should also be supplied with a "first-aid" kit, containing vaseline, peroxide, aromatic spirits of ammonia, castor oil, pennyroyal, and such other medicines or lotions as are likely to be needed. There should also be absorbent cotton, antiseptic gauze, adhesive plaster, boric acid powder, surgeon's needles in a sterile tube, some good disinfectant, safety pins, artery forceps, and scissors.

For a large camp, strong boxes should be supplied to carry the cook and mess kit, tools, etc. A full-sized, long-handled ax, saw, shovel, pick, disinfectant powder, nails, tacks, rope, twine, and a roll of stove-pipe wire should be included in the outfit.

Old clothes are not necessarily the best clothes for camping. Comfort and durability are the test qualities. No camper should feel "dressed up" or be

HOW IS THIS FOR A "COUNTRY PLACE"?

This just shows what a group of clever boys can do. They have built this entire log house and are now putting on the shingles and building the stone fireplace. Wouldn't you like to be one of them?

obliged to consider his wearing apparel unduly, but his clothes should also be able to "stand the racket."

Thin woolen underwear is usually preferable, because wool, unlike cotton, permits free circulation both of bodily moisture and air, preventing saturation and overheating. Light loosely woven woolen garments are cooler in warm weather and warmer in cold weather than those of cotton or linen.

How to Protect Your Feet

Pajamas, especially in cooler climates, should be of flannel. Socks should be of soft wool and should never be worn with holes in them; that way foot trouble lies. All these garments, especially the socks, should be changed and washed frequently.

As to outer garments, the regular uniform of the Boy Scout is a good model. Soft khaki-color cotton shirt, knickerbockers, and long stockings make a comfortable costume. Shoes may make all the difference between content and misery. For hiking you should get a broader and longer shoe than you usually wear, to allow for the spreading of the foot in walking. But avoid extremes; too large a shoe may cause an uncomfortable blister. Break the shoes in before you go to camp; take no chances on their comfort. Keep them well oiled. If they get wet inside, heat some small pebbles or sand (not too hot or they will burn the leather) and place inside the shoes. Don't let blisters or any other form of foot trouble get headway. Treat such disorders at once.

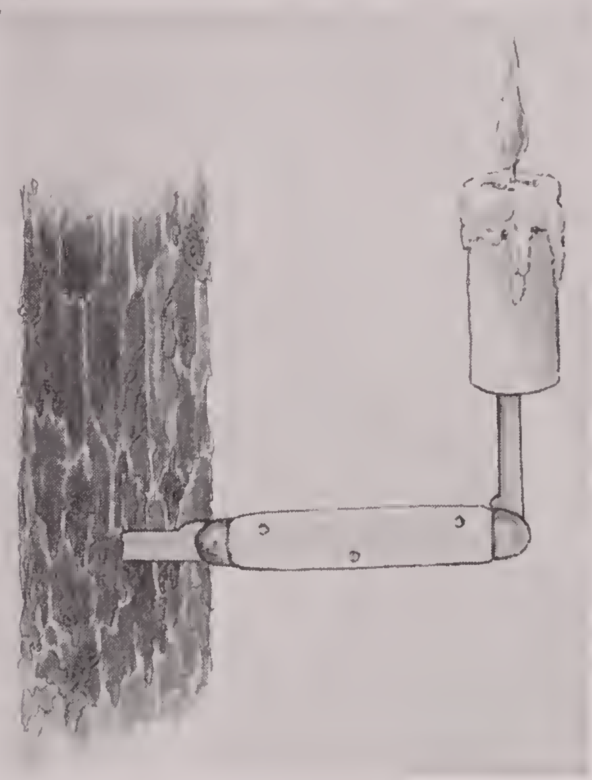
In selecting the camp site the available wood supply is an important consideration. What the woodsman calls "squaw wood"—loose dry underbrush or dead limbs—is usually abundant enough for the ordinary fire. Boys are, as a rule, too prone to resort to the ax. Trees should never be cut except where there is no available loose wood, and then never without the permission of the owner. Dead laurel branches make a quick hot, but not lasting, fire. Spruce and pitch pine also kindle quickly and burn splendidly, too splendidly for a permanent fire. Hickory, green or dry, makes the best fire of all, burns hot and long, and ends in a bed of hard long-lived coals. Next in order of excellence are the chestnut; the white, black, post, and basket oaks; pecan, ironwood, dogwood, apple, all birches, sugar maple, locust, and yellow pine.

How a Woodsman Builds a Fire

Nothing betrays the tenderfoot or shows the skill of the experienced woodsman more quickly than the way he builds a fire—and also the thoroughness with which he puts it out when he retires or breaks camp.

Fire is the forest's worst enemy, and a single live coal may smolder on for hours, to be whipped into a disastrous forest fire by a puff of wind. When you leave a camping place, pour water or heap earth on your fire—lots of it, until nothing is left to start a blaze.

A CANDLESTICK THAT STICKS



By this very simple device you can have a candle in camp and fix it at any height you wish.

When a woodsman builds a fire he carefully selects a place where the wind will not carry the flames into dry leaves or bushes. If the ground is covered with leaves, he scrapes a place bare and builds a little rampart of stones to keep the flames from spreading. If the ground is wet or covered with snow, he lays a little platform of small logs to keep the embers from sinking in. Before he lights his match—and one match is all a good camper needs—he sees that he has plenty of fuel cut and stacked for the particular sort of fire he needs; for you know there are several kinds of fires, and the fire that is good for one purpose is useless for another. Dry leaves and twigs picked off the ground make good tinder to start a fire; but if things are wet, you must at times break off small sticks from the under branches of a soft-wood tree and whittle them into little cones of shavings, leaving the shavings attached to the stick. The resinous bark of the birch tree is far and away the best kindling.

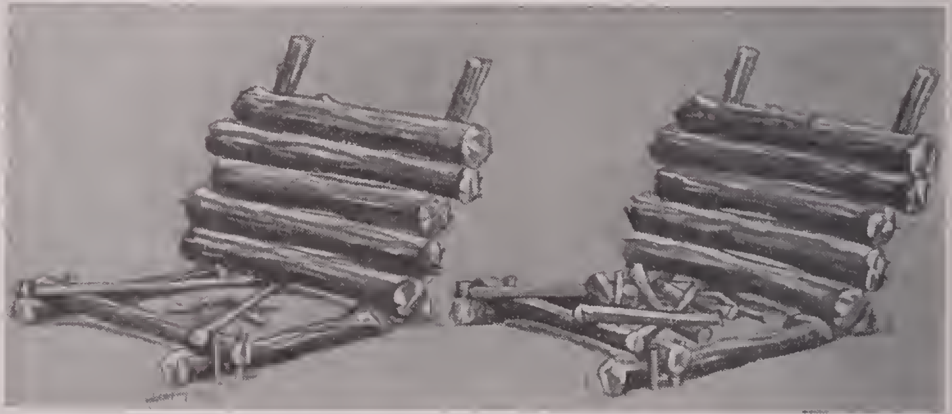
The king of camp fires is the backlog fire. Cut two 2-inch stakes of some green hard wood about four feet long, and drive them into the ground about two feet apart, leaning away from the front of the tent and eight to ten feet distant. Against these pile five logs, three feet long and four or five inches in diameter. Choose some hard wood that will not burn out quickly, for you want the backlogs to reflect heat into the tents and to last as long as possible. Place two smaller and shorter logs at right angles for andirons; then stake a forelog across the ends of these, and you have a framework to hold the fire together and insure good draft. In the center build up a pile of dry leaves, twigs, birch bark, or shavings, with a few dry sticks on top. Now lay two long sticks diagonally from the forelog to the backlogs, meeting at the back; and on these place four or five logs of hickory, birch, maple, chestnut, or oak, with plenty of air space between. Thrust a number of small dry sticks downwards into the chinks, touch a match to the tinder below, and in a few minutes you will have a pillar of flame six feet high to eat your evening meal by. Put on another load of logs before you turn in, and the blaze will last far into the night.

All the romance of camping is concentrated in the evening camp fire, the consummation of a "perfect day," a send-off to a night of sleep such as no city dweller ever knew.

You gather around the fire, your appetites appeased, the dishes washed and garbage buried, a little tired with the million activities of the day, at least willing to sit quiet for a space. The fire blazes up. You gather closer with a sense of nearness each to the other which day never brought. This is the hour of comradeship. Around the fire you talk and laugh and recount the day's adventures, discuss the morrow's plans. You sing songs, a little off the key perhaps, but with a right good will. Somebody spins a yarn, while the rest of you listen and watch the sparks fly up to heaven. Camping is good, all of it; but this hour around the camp fire is the best of it, the essence of the whole experience, the heart of its magic.

For breakfast next morning the charred remains can be collected to make a "Chinook" fire, as good a breakfast fire as anyone ever devised. Probably three of the backlogs will be only half charred through. Lay one of them over the andirons for a forelog and put the other two side by side a little farther back. Now build a fire underneath, using birch to give it life and maple or hickory to make long-lived coals.

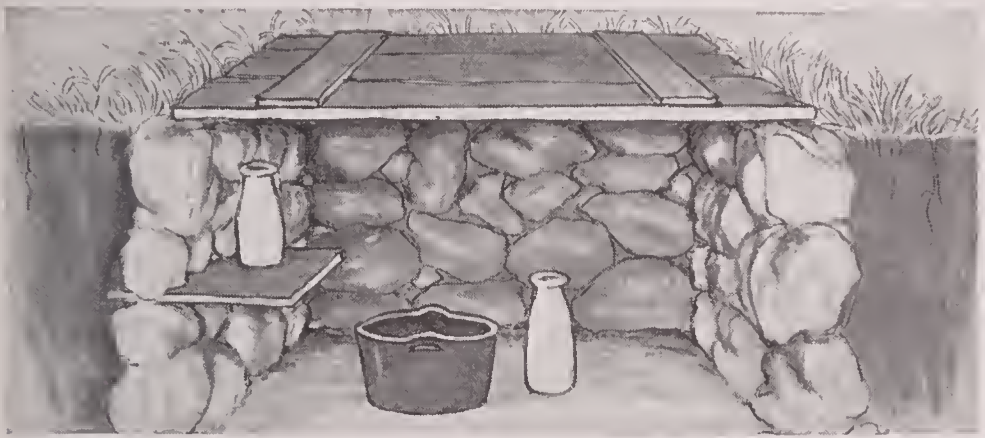
THE KING OF CAMP FIRES



Here you see just how to build the Backlog Fire, the details of which are explained in the text.

Hang your coffee pot at the end of a sapling resting in the crotch of a stick and pegged down at the other end, or on a cross-bar lashed to two sticks driven into the ground. Your frying pan rests on the two rear logs, and if you want to bake bread, you can scoop out a hollow under the blazing forelog, fill it with coals, and set your covered frying pan of batter in the hollow, where it will get heat above and below.

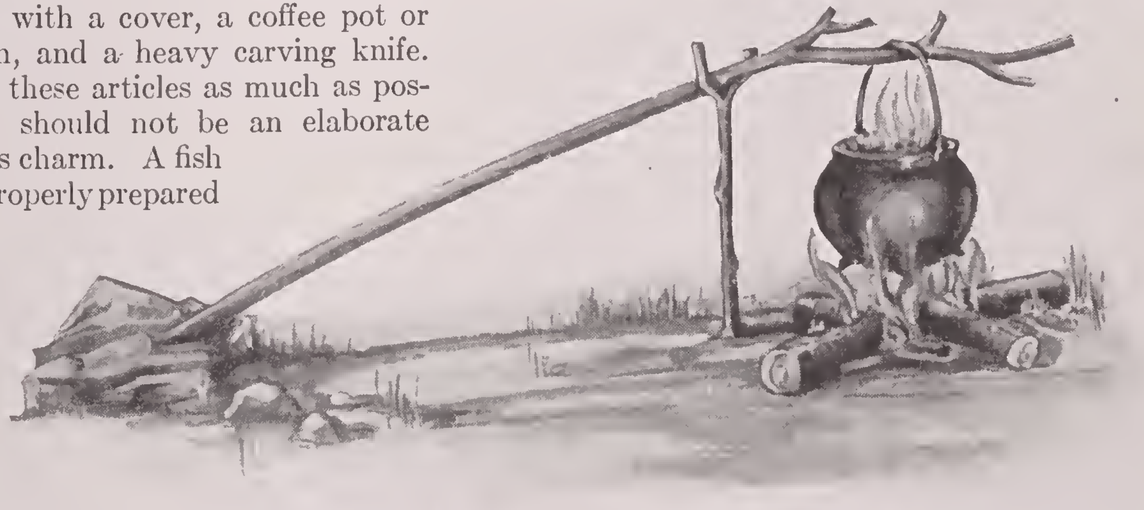
A HANDY LITTLE CELLAR



To keep milk and other things cool, dig a pit and line it with stones, as here shown; then add the "cellar door." The method of putting in the "shelving" is obvious, but unless you have a good many things to store, it is not necessary.

If you want nothing but a cooking fire, there is nothing better than an improvised fireplace of slabs of stone, set on end, with a wire grate on top to support the pans. A crib of small split sticks of hickory or blackjack oak, built up in rows across each other, under this will give you a splendid cooking fire. For a cooking fire without a grate, pile twigs and split sticks in a pyramid around the starting material and drive in two uprights with a cross pole to which you can hang your kettle. A pair of logs placed like a V about the fire give you a convenient place to rest the frying pan when the wood burns down to coals.

Every person in camp should have his personal mess kit, consisting of knife, fork, spoon, plate, and cup. In addition, there should be at least one stew pan and a frying pan with a cover, a coffee pot or tin pail, a large spoon, and a heavy carving knife. Keep down the list of these articles as much as possible. Camp cookery should not be an elaborate affair, or it loses half its charm. A fish fresh from the water, properly prepared and cooked on a stick over a fire beats any banquet. Speaking of stick cooking, "twist" or biscuit dough, baked on a peeled pole of sweet green wood, is an easily prepared and toothsome article of food.



A safe way to put the pot to boil without burning the support.

"Grub" is good camp parlance. It is also an important matter to consider when you plan your trip. The pamphlets on 'Cooking' and 'Camping', the 'Handbook' itself, and 'The Pine Tree Patrol', all published by the Boy Scouts, are full of suggestions.

Here is Kephart's list of hiking rations for four boys, three meals:

Four pounds breadstuffs, in bag or waxed paper; one pound bacon, sliced thin, without rind, in waxed paper; one pound cheese, in waxed paper; one dozen eggs, in carton; one can evaporated milk, not sweetened; one-half pound butter, in tin; one-half pound sugar, in bag; one-half pound dried fruit, in waxed paper, or lemons; one-fourth pound ground coffee, in bag; one can jam; one-sixth pound salt, in joint of bamboo, corked; pepper, in waxed paper.

It is hardly necessary to tell an ordinary boy or girl what to do in camp. The day will not be long enough to get in all the things one wants to do in the woods, especially if the camp is on a river or lake. Rowing, canoeing, fishing, swimming, hiking, nature study, stalking wild life with a camera, and hosts of other alluring pursuits will make one grudge the time that must be set apart for cooking, dish-washing, wood-gathering, and keeping the camp in order.

No perfection of equipment or location, no special dispensation of the weather man, not even marvelous "grub," can make a camping expedition a success. In this, as in most things, it is the spirit that matters most. If you go into camp prepared to "grouch," you will find plenty to grouch about. There may be too much rain and too many mosquitoes. The potatoes may be scorched, and your tent may get blown over because you didn't drive your tent pegs securely. But you won't let such things spoil everything for yourself and the others. You came to camp to rough it. If you had wanted to wallow in luxury you would have chosen a different place to spend your holiday.

The spirit of a camp is an intangible thing. It cannot be measured by a tapeline or a pint cup. But it is a perceptible thing for all that. You know when your camp *hasn't* it. You know when it *has* it. It is made up of many things,—fair play, good fellowship, kindliness, cheerfulness, the sense of "togetherness," all for each and each for all. It is for you—all of you—to gain or to lose, to make or to mar. The spirit of the camp is *your* spirit.

ONE OF CANADA'S MANY BEAUTIFUL LAKES

Could anything be more entrancing than this view of Lake Louise in the Rocky Mountains Park in Alberta, near the line of the Canadian Pacific Railroad? This beautiful lake lies 5,800 feet above sea level at the foot of the great snow-covered Mt. Victoria, which you see in the background.

The LAND *of the* MAPLE LEAF BRITAIN'S ELDEST DAUGHTER

CANADA. "The 20th century belongs to Canada," said Sir Wilfrid Laurier, then premier of the Dominion, as the tide of immigration at the beginning of that century began flowing into the great Canadian Northwest. By this he meant that, as the 19th century saw the rise of the United States from one of the smallest and poorest nations to the wealthiest and one of the greatest, so the present century would be marked by a notable expansion in population and wealth in Canada.

Extent.—Area of Canada, about 3,730,000 square miles. Extent east and west, 2,700 miles; north and south (excluding Arctic archipelago), about 1,600 miles. Most northerly point, Cape Columbia (in Grant Land), about 475 miles from the Pole. (Newfoundland and the Labrador coast are not included in the Dominion of Canada.) Population, about 9,000,000.

Rivers and Lakes.—St. Lawrence, Ottawa, Nelson, Churchill, Red, Saskatchewan, Athabaska, Peace, Mackenzie, Slave, Yukon, and Fraser rivers. Largest lakes (excluding the Great Lakes, which form part of the southern boundary), Great Bear, Great Slave, Winnipeg, Athabaska, Reindeer, Winnipegosis, Manitoba, Nipigon, Lake of the Woods.

Mountains.—Coast Range, Rocky Mountains, Selkirk Mountains, Gold Range, Caribou Mountains, all on Pacific coast. Highest mountain, Mt. Logan (19,539 feet), in Saint Elias Range near Alaskan frontier.

Chief Products.—Wheat, oats, barley, hay, flax, potatoes, turnips, orchard fruits, live stock, and dairy products; lumber, pulpwood, and other forest products; textiles, agricultural implements, iron and steel, leather, shoes; salmon, cod, halibut, haddock, and other fish; coal, nickel, copper, silver, lead, cobalt, zinc, asbestos, and other minerals; furs.

Provinces.—Maritime: Nova Scotia; New Brunswick, Prince Edward Island; eastern: Quebec, Ontario; western: Manitoba, Saskatchewan, Alberta, British Columbia. Territories: Yukon Territory, Northwest Territories (Provisional Districts of Mackenzie, Franklin, and Keewatin).

Chief Cities.—Montreal, Toronto (both over 500,000 population); Winnipeg, Vancouver, Ottawa (capital), Hamilton, Quebec (over 100,000); Calgary, Edmonton, Victoria, St. John, Halifax, London (over 50,000).

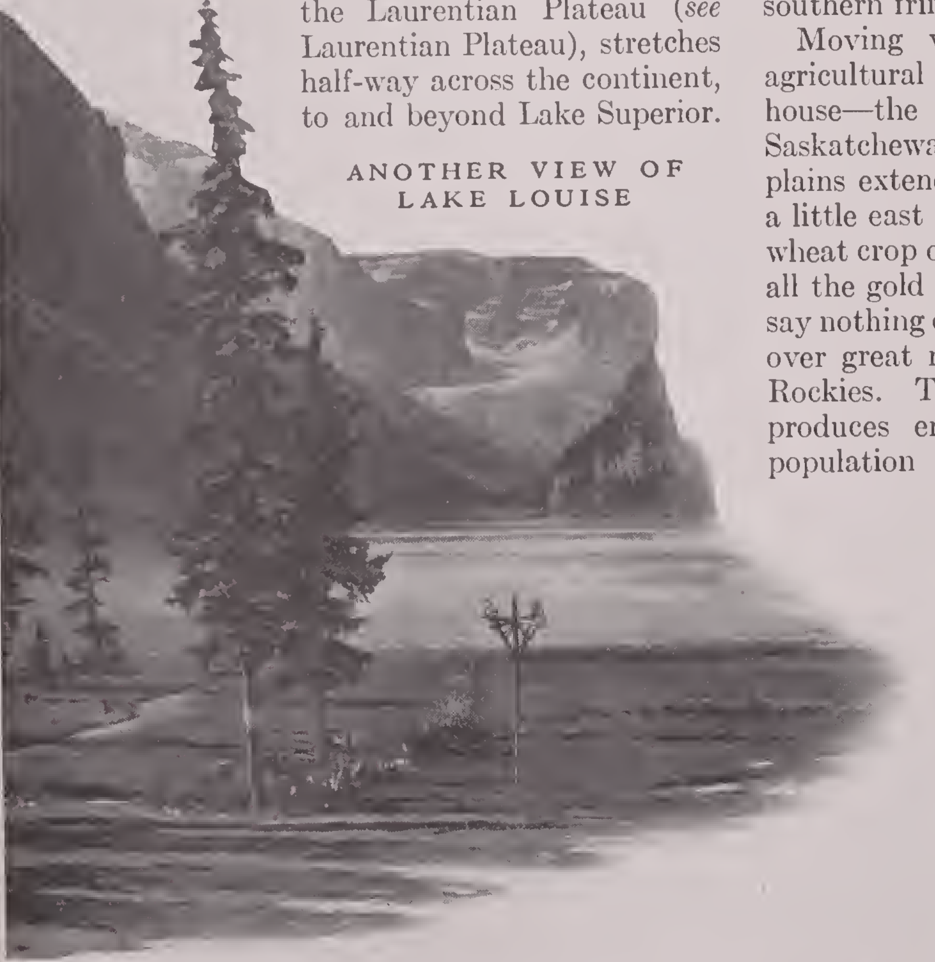
For this high hope Laurier had good grounds. Canada's population of 5,000,000 at that time was concentrated in a narrow belt along the southern boundary, just as the 5,000,000 of the United States in 1800 clung to the Atlantic seaboard. Beyond this belt lay the vast heritage of the Northwest, awaiting only the plow of the settler to make it one of the world's greatest granaries—a region surpassed in its possibilities only by the fertile plains of the Mississippi valley and the remoter West, which had beckoned to American enterprise a century earlier. And, just as in the United States, untold wealth in minerals and timber awaited the magic touch that would bring them into the channels of commerce and turn them to the service of man.

Events have already gone far to realize Laurier's hopes. Since 1901 more than 4,000,000 have been added to Canada's population, when it came to be known that Canada had the largest area of desirable and unpeopled land within a civilized country. The railway mileage has been more than doubled, opening the way into parts of the Dominion formerly inaccessible to the settler and prospector. The acreage of tilled land has also been more than doubled, and the value of manufactured products has increased sixfold.

But with all this progress, Canada has not yet realized a twentieth part of its possibilities. In extent, it is itself an empire. Its 3,730,000 square miles comprise an area somewhat greater than the United States and Alaska, and nearly as large as Europe. It forms one-third of the land surface of the whole British Empire, and would hold the British Isles 30 times over. Its southern cities are in the same latitude as Rome, though its northern islands sleep in the everlasting silences of Arctic ice and snow. The 2,700-mile journey from Halifax to Vancouver takes five days in the swiftest through trains. Yet this immense territory, which could support 200,000,000 people in its habitable portions, has a population less than that of the state of New York, and one-quarter of its surface, chiefly in the far north, has never been thoroughly explored.

The traveler entering Canada from the east, by way of the Gulf of St. Lawrence, comes first to the region where the ax has hewed nearly every inhabited acre out of the "forest primeval." This first division, which includes the St. Lawrence valley and most of the old worn-down mountain system called the Laurentian Plateau (*see* Laurentian Plateau), stretches half-way across the continent, to and beyond Lake Superior.

ANOTHER VIEW OF LAKE LOUISE



Here is another view of beautiful Lake Louise, with a long look up the glacier-filled chasm of the mountains. The land bordering the lake in the foreground has been converted into a park.

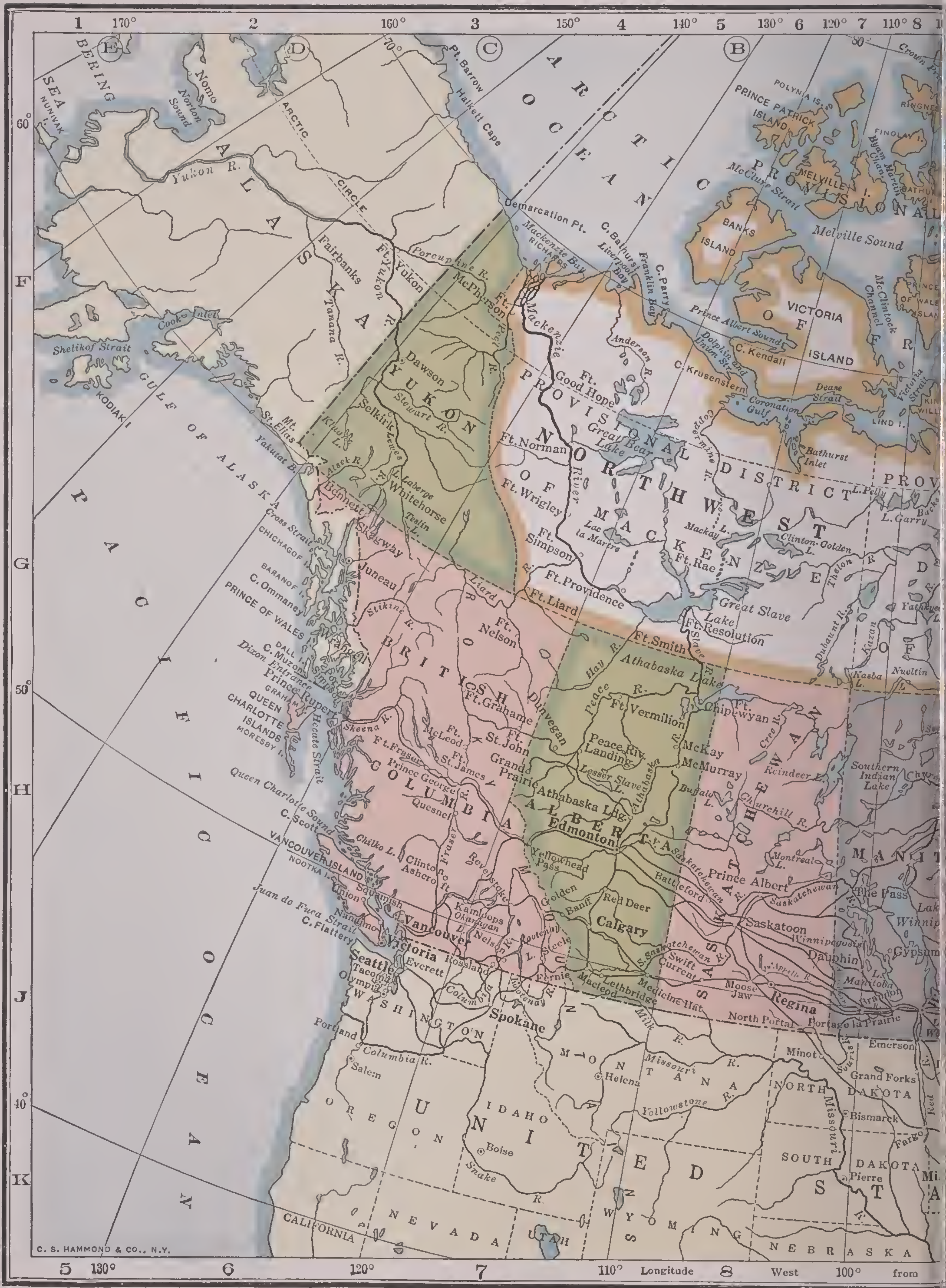
Thrusting off from it to the southeast are the Maritime Provinces—New Brunswick, Prince Edward Island, and Nova Scotia—partly cut off from the rest of the Dominion by the northern part of Maine. The rest of eastern Canada is included in the provinces of Quebec and Ontario. Here are about two-thirds of all the people of Canada, chiefly clustered along the southern border. The wealth of forests and minerals and water-power back of this southern fringe is beyond computation.

CLIMBING THE ROBSON GLACIER

This great river of ice flows down from Robson Peak, one of the highest mountains of Canada, situated near the eastern border of British Columbia.

Moving westward, the traveler comes to the agricultural heart of Canada, its richest treasure-house—the three prairie provinces of Manitoba, Saskatchewan, and Alberta. For 800 miles these vast plains extend in gently rolling waves, reaching from a little east of Winnipeg to the Rockies. One year's wheat crop of Saskatchewan alone is worth more than all the gold that ever came out of the Klondike, to say nothing of the other crops and the cattle that roam over great numbers of ranches at the foot of the Rockies. The rich soil already in "bumper" years produces enough surplus wheat to feed twice the population of the British Isles. Leaving out of account the far northern sections, where the summers are too short and the land too rugged for cultivation, and a few other stretches unsuitable for agriculture, authorities estimate that more than 150,000,000 acres in the prairie provinces remain to be brought under the plow. But each succeeding year sees the area of settlement extending and more acres added to the golden wheat fields of the Northwest.

Pushing on to the west the traveler comes to the foothills of the Rockies, behind which tower lofty summits visible for 80 miles or more in the clear air. As your train penetrates this barrier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Ft. Yukon
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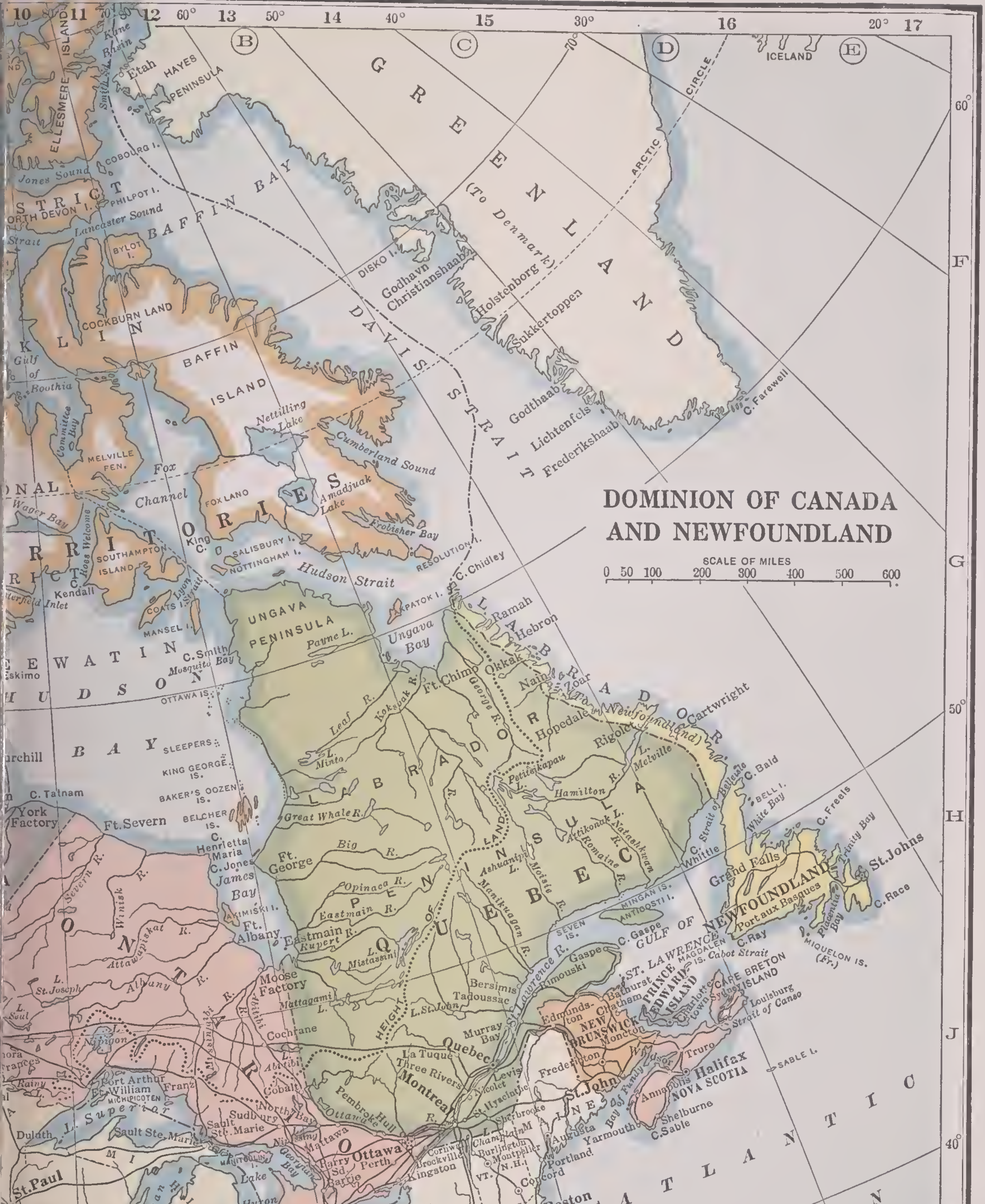
Tanana R.
Porcupine R.
Cook Inlet
Shelikof Strait
KODIAK I.
GULF OF ALASKA
Mt. St. Elias
Yakutat B.
Demarcation Pt.
Mackenzie Bay
RICHARDS I.
C. Bathurst
Liverpool Bay
Franklin Bay
C. Parry
Ft. McPherson
Peel R.
Mackenzie R.
YUKON
Dawson
Stewart R.
Selkirk
Kluane L.
Lewes R.
Alsek R.
L. Laberge
Whitehorse
Teslin L.
Bennett
Skagway
Juneau
Cross Strait
CHICHAGOF I.
BARANOF I.
C. Ommaney
PRINCE OF WALES I.
DALL I.
C. Muzon
Dixon Entrance
Wrangell
Pt. Simpson
Prince Rupert
GRAHAM I.
QUEEN CHARLOTTE ISLANDS
MORESBY I.
Hecate Strait
Queen Charlotte Sound
C. Scott
VANCOUVER ISLAND
NOOTKA I.
Juan de Fuca Strait
C. Flattery
PACIFIC OCEAN
POLYNIA IS.
PRINCE PATRICK ISLAND
MELVILLE I.
Byam Martin Channel
McClure Strait
BANKS ISLAND
Melville Sound
PROVISIONAL
VICTORIA ISLAND
McClintock Channel
PRINCE OF WALES ISLAND
Prince Albert Sound
Dolphin and Union Str.
C. Kendall
C. Krusenstern
Anderson R.
Coronation Gulf
Dease Strait
Victoria Strait
LIND I.
Bathurst Inlet
Coppermine R.
Ft. Good Hope
PROVISIONAL DISTRICT OF MACKENZIE
NORTHWEST
Great Bear Lake
Ft. Norman
Ft. Wrigley
Mackenzie River
Lac la Martre
Mackay L.
Clinton-Golden L.
L. Pelly
L. Garry
Backs R.
Ft. Simpson
Ft. Rae
Ft. Providence
Ft. Liard
Liard R.
Great Slave Lake
Resolution
Thelon R.
Dubawnt R.
Kazan R.
Yathkyed L.
Kasba L.
Nueltin L.
Ft. Smith
Slave R.
Athabaska Lake
Stikine R.
Ft. Nelson
BRITISH COLUMBIA
Hay R.
Peace R.
Ft. Vermilion
Ft. Chipewyan
Ft. Grahame
Dunvegan
Skeena R.
Ft. McLeod
Ft. St. John
Ft. Fraser
Ft. St. James
Grande Prairie
Peace Riv. Landing
McKay
McMurray
Lesser Slave L.
Athabaska R.
Athabaska Ldg.
Prince George
Quesnel
Fraser R.
Chilko L.
Clinton
Ashcroft
Revelstoke
ALBERTA
Edmonton
Yellowhead Pass
Golden
Banff
Red Deer
Calgary
ROCKY MTS.
SASKATCHEWAN
Cree R.
Reindeer L.
Churchill R.
Buffalo L.
Montreal L.
Prince Albert
Saskatchewan R.
Battleford
Saskatoon
Southern Indian Lake
MANITOBA
Pas
Winnipegosis
Dauphin
Gypsum
Winnipeg
L. Manitoba
Brandon
Union
Squamish
Nanaimo
Vancouver
Victoria
Kamloops
Okanagan L.
Nelson
Kootenay R.
Rossland
Ft. Steele
Fernie
Macleod
Lethbridge
S. Saskatchewan R.
Swift Current
Medicine Hat
Moose Jaw
Regina
Qu'Appelle R.
North Portal
Portage la Prairie
Emerson
Seattle
Everett
Tacoma
Olympia
WASHINGTON
Columbia R.
Spokane
Portland
Salem
OREGON
IDAHO
Boise
Snake R.
MONTANA
Helena
Milk R.
Missouri R.
Yellowstone R.
NORTH DAKOTA
Minot
Grand Forks
Bismarck
Fargo
Missouri R.
Red R.
SOUTH DAKOTA
Pierre
UNITED STATES
WYOMING
NEVADA
UTAH
CALIFORNIA
NEBRASKA
C. S. HAMMOND & CO., N.Y.
5
130°
6
120°
7
110°
Longitude
8
West
100°
from



DOMINION OF CANADA AND NEWFOUNDLAND

SCALE OF MILES

A VIEW IN A CANADIAN NATIONAL PARK

This view takes us to another part of the Rocky Mountains Park, near Banff, the famous summer resort in southwestern Alberta. We are looking up Devil's Canyon, below Lake Minnewanka. This dam and its rushing falls are symbolic of Canada's tremendous supply of water power.

you come into British Columbia, the province of the Pacific seaboard, ridged and furrowed by mountain and valley as if some giant had crumpled the whole land in his hand like a sheet of paper. Dense forests cover nearly the whole of the province, yielding only here and there to strips of farmland or cattle ranches.

To the north of the 60th parallel of latitude, which forms the boundary of British Columbia and the three prairie provinces, the traveler, if he is adventurous enough to take the unusual journey, will find the almost uninhabited wastes of the Yukon Territory and the Northwest Territories. This vast section of Canada—more than one-third of its entire area—is given over to the miner and the trapper. Forested valleys and mountain slopes and bare uplands cover most of the Yukon region, while much of the Northwest Territories is in summer covered with lakes, quaking swamp, and arctic tundra. Included in this is the huge district about Hudson Bay known as the Barren Lands.

Here, however, are found millions of valuable fur-bearing animals, forming one of the world's greatest fur supplies, and here, too, roam innumerable caribou—at least 30,000,000 according to one authority—which may some day furnish to the world an important addition to its meat supply.

With the exception of the United States, no land is more abundantly endowed with nature's great gift of water. The Atlantic and Pacific oceans wash its shores for 13,000 miles, and Hudson Bay, a huge landlocked arm of the Atlantic, reaches from the north far into the heart of the continent. It was by means of the Hudson Bay water route from Europe that some of the early English explorers arrived at the interior plains; and this route is now being made available by the Hudson Bay Railway to Port Nelson and may transport to Europe part of the wheat of the prairie provinces. This railway will effect an average shortening of the distance from the western wheat fields to the Atlantic seaboard of nearly 1,000 miles, and if the navigation proves practicable may save to the farmer millions of dollars yearly in freight charges.

THE LARGEST GRAIN ELEVATOR IN THE WORLD

In this enormous elevator at Port Arthur, Ontario, on the northern shore of Lake Superior, 10,000,000 bushels of grain can be stored at one time. Into these giant bins pours much of the grain from the vast fields of northern Canada, and out of them it pours into ships to be carried to markets far and near.

Farther south, the St. Lawrence also opens a broad gateway toward Europe, forming a link in the finest system of interior waterways in the world—of rivers, canals, and lakes stretching for 2,400 miles from the Atlantic to the head of Lake Superior. Two great river systems—the Nelson-Saskatchewan and the Mackenzie-Athabaska—rising in the Rocky Mountains and emptying respectively into Hudson Bay and the Atlantic Ocean, formerly provided convenient highways through the plains region, but are now being superseded by railways. Several rivers of lesser size but scarcely less important for the development of this country are the Churchill, the Red River of the North, the Assiniboine, and the Peace River. The mountain regions of the West also have their great rivers—the Columbia, the Fraser, and the Yukon—the latter forming, until the building of the White Pass and Yukon Railway, practically the only highway for communication between the settled parts of Canada and the mineral-bearing section of the Klondike-Yukon region.

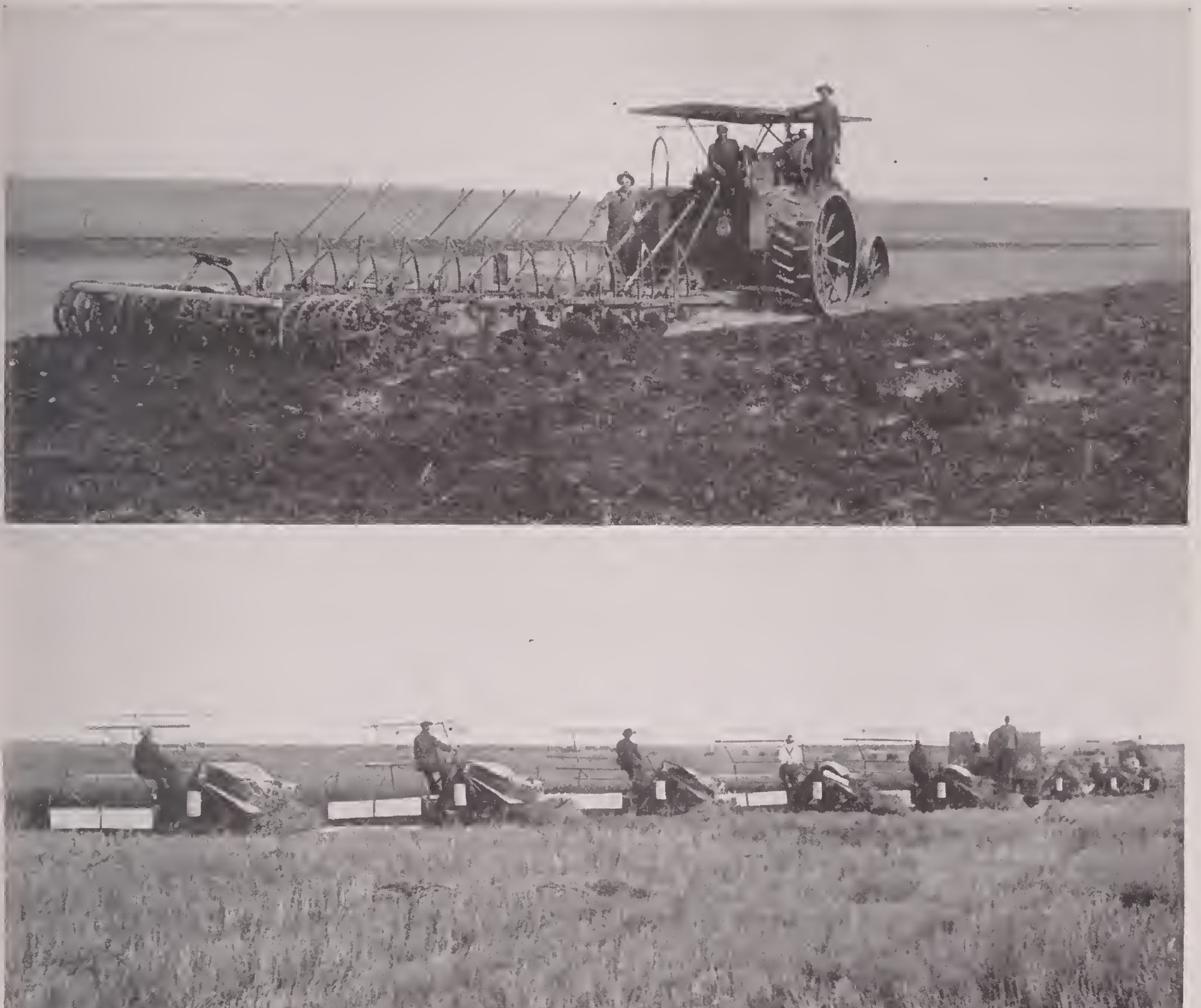
IN A NOVA SCOTIA APPLE ORCHARD

Nova Scotia is famous for its fruits. The apples from this region are known all over the world. They are one of the principal articles of export of the province.

Innumerable smaller streams and thousands of lakes gleam amid the forests and plains of the interior, the lakes ranging from mere ponds and fish-haunted pools to bodies of water twice the size of Lake Erie, among these being Great Bear Lake, Great Slave Lake, Lake Manitoba, and Lake Winnipeg. Indeed, Canada boasts nine lakes which have a length of more than 100 miles each, 35 which are more than 50 miles long, and a thousand others of considerable size.

This unrivaled water system, in addition to its services in tempering the climate and providing transportation, furnishes the Dominion with one of the greatest potential sources of power. In the peopled parts of Canada alone it is estimated that more than 8,000,000 horse-

LIFE ON CANADA'S GREAT WHEAT FARMS



These three pictures illustrate three great phases of farming life on the vast and fertile plains of western Canada. Everything is done on a big scale. First comes the breaking of the rich black soil with ten or more plows working side by side and drawn by a tractor. Then at harvest time many reapers, from four to six, also drawn by tractors, reap the golden harvest. Last of all comes the threshing, and then the hauling of the grain to the market.

RIDING LOGS IN NEW BRUNSWICK

In the densely wooded mountainous country of the northern and northwestern portions of New Brunswick lumbering is a leading industry. The scene here shown is on the Miramichi River, which drains a quarter of the province. The river not only floats the logs to the sawmills, but runs the machinery of the mills. These nimble-footed "log drivers" are on hand to see that the logs don't "jam" on the way.

power is available—enough to turn the wheels of all the nation's industry when once it has been harnessed by hydroelectric plants. Seventy-five per cent of the power used in Quebec is already drawn from this source, and as yet only a small fraction of the available power has been developed.

Plentiful rainfall keeps most of the inland waters well supplied and ensures bounteous crops. On the Pacific slopes the moisture is excessive, and only in the southwestern portion of the prairie provinces, where the Rocky Mountains intercept the rain-bearing winds from the Pacific, are there extensive arid belts. But even there in some sections water is obtainable from mountain streams and artesian wells.

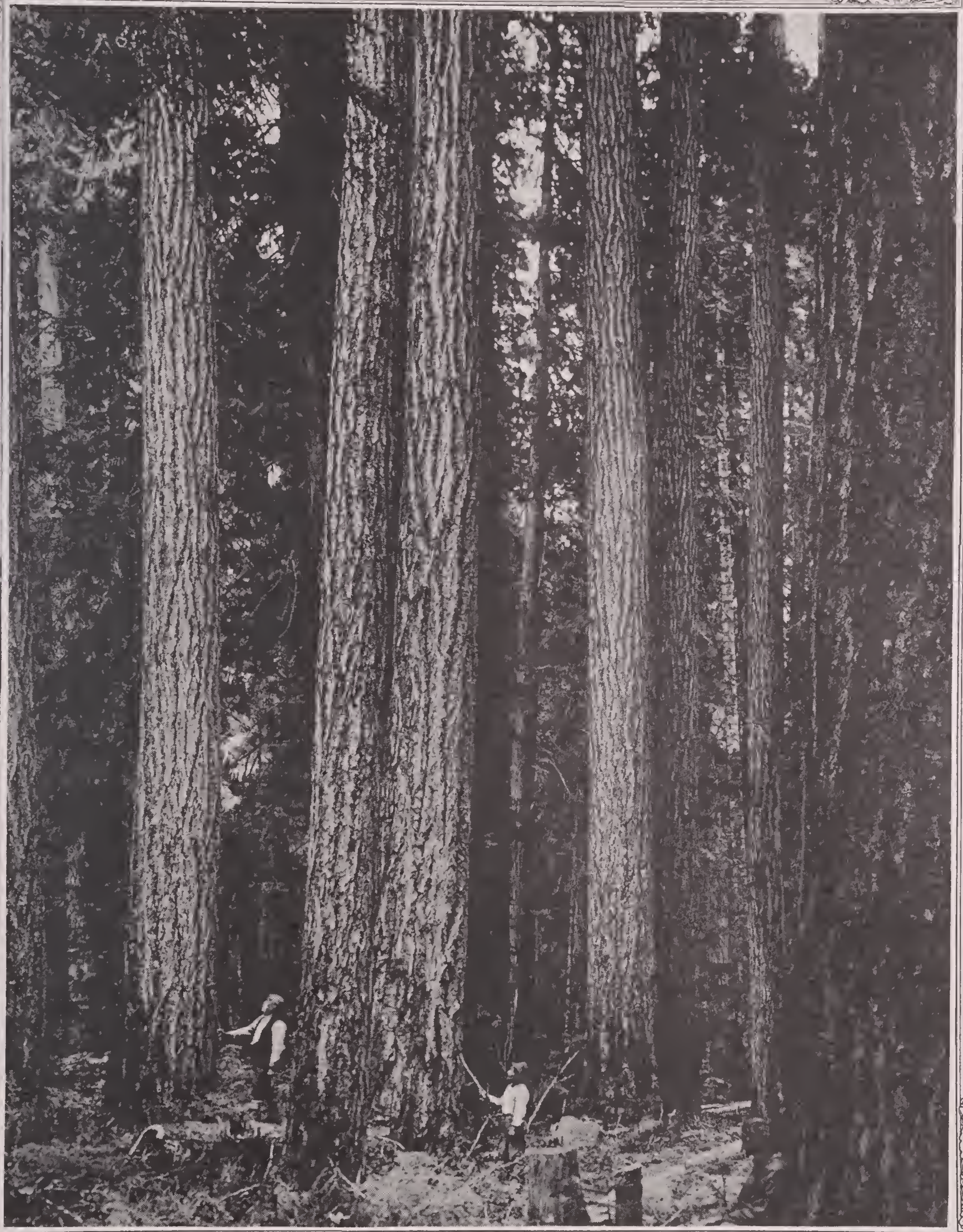
Most parts of the Dominion have a continental climate with cold winters and warm summers, but the great extremes in temperature are made endurable by the dryness and clearness of the air. The warm winds blowing from the Pacific make the western coast much warmer than the eastern; and the western portions of the prairie provinces have a milder climate than corresponding latitudes in the eastern provinces.

A LOGGING TRAIN ON VANCOUVER ISLAND

In the preceding picture we were in the woods of New Brunswick. Here we are in the lumber regions clear on the other side of Canada. This view was taken on Vancouver Island, off the coast of British Columbia, and it shows a logging train on the Canadian Pacific railroad. Notice that these magnificent logs are so long that they occupy several cars. The island is covered in large part with exceedingly dense forests.

The leading industry of Canada is agriculture, and at least one-half of the population depends upon farming for support. The great development in this industry came in the latter part of the 19th and the beginning of the 20th centuries, with the western extension of the railroads. Before 1885 there were

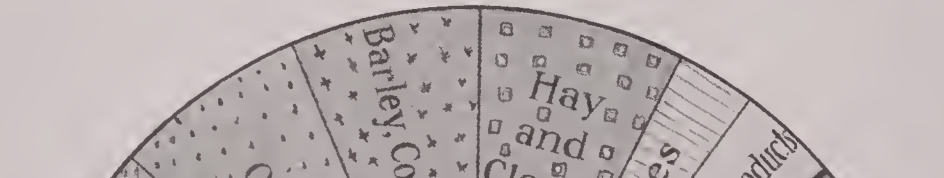
HOW THE FOREST GIANTS OF CANADA GROW UP



It's wonderful how tall and straight some of these Canadian trees grow, going right up into the air for 40, 50, or 60 feet without ever a branch or a hint that they intend to branch. It's as if they realized they were going to be spars on some gallant ship. And indeed that is the very destiny of many of these glorious giants in the forests of British Columbia, where we now are. The principal timber of commerce in this region is the Douglas Fir, which often grows 300 feet high and 8 to 10 feet in diameter. It is this tree that is so highly valued for ship spars, as well as for building. The red Cedar, which rivals the Douglas Fir in size, is used for shingles and interior work. Lumber from these trees and others is shipped not only to other parts of Canada, but to South America, Africa, Australia, China. And do you know that the "lumber cruisers," as the men who prospect timber are called, can, with a glance of the eye and with their measuring sticks, tell almost to a foot how many feet of lumber of any given size one of these trees will make?

CODFISH AND SALMON FROM CANADIAN WATERS

We caught those codfish off the coast of Nova Scotia—let's play we did—and here they are drying in the sun at Halifax. On the right we are looking down the unloading platform of a big salmon cannery in British Columbia.



This "pie graph," as such diagrams are sometimes called, shows us the relative importance of Canadian industries. Notice how varied are the products of this great land.

practically no settlers on the great prairies of Alberta and Saskatchewan, and but few in Manitoba, because of the lack of direct communication with the east. In that year the Canadian Pacific Railway was completed, and since then two other railways across the continent have been built—the combined National Transcontinental and Grand Trunk Pacific and the Canadian Northern—opening up the vast prairie sections which today are among the greatest grain-growing areas of the world. Wheat is the most important product, but other grains—oats, barley, rye, and flax—are grown. Nova Scotia and Ontario on the east and British Columbia on the west are famous for their fruits, and flax is extensively grown, especially in the western provinces. Stock-raising is also an important industry of the plains, where some of the large ranches formerly covered thousands of acres, but have been succeeded by smaller though much more numerous ranches.

The Dominion and provincial governments have contributed largely to the development of Canadian agriculture by spending vast sums on experimental farms, subsidizing cold storage warehouses, operating terminal grain elevators, encouraging immigration, and in

A MOVING PICTURE FLIGHT OVER CANADA

Over the Roofs of Winnipeg

Bank of Montreal and the City Beyond

In the Heart of Ottawa

Yonge Street "Canyon," Toronto

Vancouver Overlooking the Harbor

St. John and the Famous "Reversible Falls"

Now, suppose in a flying machine we are crossing Canada, taking snapshots as we go. Let us start our flight over the roofs of Winnipeg, just about midway from ocean to ocean. We then pass over historic Montreal. Next comes Ottawa, the beautiful capital of the Dominion. Then we fly close over the prosperous streets of Toronto. Then we make a long trip to far away Vancouver, with its great harbor gate to the Pacific. And finally cross the continent again to visit St. John, New Brunswick, and see the famous reversible falls which flow one way and then the other, as the tide rises above and falls below the level of the river.

WHERE COPPER IS "COOKED" FROM CANADIAN ORE

Although the development of the rich copper resources of British Columbia has only begun, there are already in this region several great copper smelting plants. One of these, that at Trail, is here shown.

many other ways. The total acreage under cultivation is increasing every year, but even now less than 10 per cent of the Dominion's 450,000,000 acres of arable land is being tilled.

Next in importance in the list of Canada's natural resources are the vast shaggy forests which belt the land diagonally from east to west, covering nearly one-third of the whole surface. So little is yet known of this enormous region that estimates of its extent vary greatly, ranging from half a billion to a billion acres. It is generally agreed, however, that there are from 200,000,000 to 300,000,000 acres of merchantable timber, about one-half of the area and one-third of the supply available in the United States. Warned by the experience of her southern neighbor, Canada is conserving this great resource, and has set aside 159,000,000 acres of forest reserves.

In minerals, too, Canada is richly endowed, though development is still so slight that the country pays more for imported minerals than it receives from its mines. Almost every important mineral is known to exist somewhere in Canada, though geologists as yet have thoroughly surveyed only the southern regions. Of chief importance are the coal, nickel, copper, silver, gold, zinc, cobalt, and lead deposits. Practically the whole of the world's supply of cobalt and asbestos and the greater part of its nickel come from Canada. The Dominion has about 70 per cent of the coal reserves of the whole British Empire, but its distribution, chiefly in the foothills and mountains of the west, makes development and transportation expensive. There are also immense deposits of iron, but here too Canada is backward, because for the most part the iron ore and the coal necessary for smelting it are widely separated. Natural gas is found in several of the provinces, chiefly in Alberta and Ontario, and petroleum is also produced in small quantities in these provinces. The great stretches of bituminous sands along the Mackenzie River may become an important source of oil supply.

In the extent and value of its fisheries Canada leads the world. The finest food and game fishes abound everywhere, in the lakes and rivers as well as in the coastal waters. Three-fifths of the annual catch is exported, chiefly to the United States. The same far-sighted conservation policy which has been applied so effectively in other lines is in force here too.

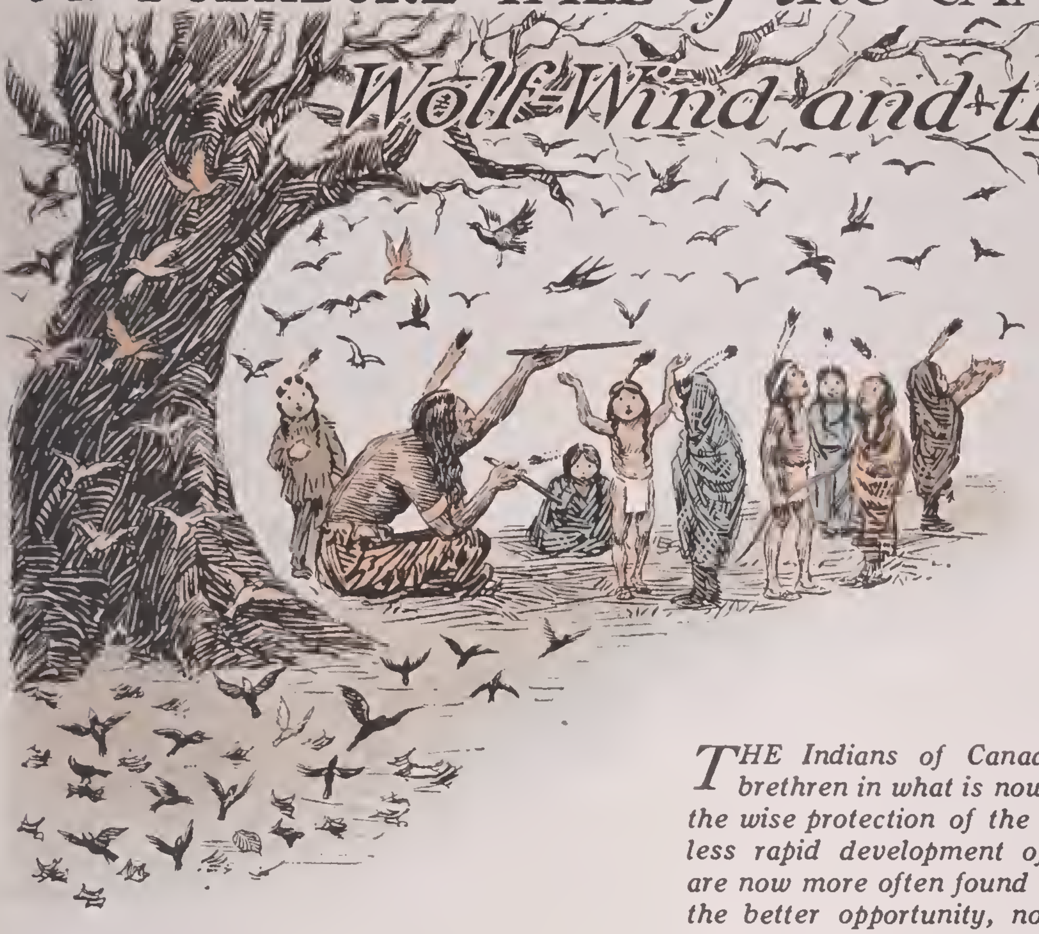
Fur-farming is becoming an important industry, as the steady depletion of the world's fur-bearing animals causes the price of furs to advance. Foxes, skunks, minks, raccoons, fishers, beavers, and muskrats are bred chiefly in the Maritime Provinces.

With her limitless and almost untouched natural resources, and her boundless water-power, Canada is destined to become a great manufacturing nation. Already the value of Canadian manufactures considerably surpasses the value of the farm products. The greatest single item is the manufacture of food products, which uses the farm products as raw material. Canadian manufactures in general are of comparatively late growth, being heavily handicapped by American competition and somewhat limited markets. During recent years, however, they have grown by leaps and bounds, especially under the stimulus of the World War of 1914–18.

More than four-fifths of the people of Canada were born in the British Empire, most of them in Canada itself, though of recent years there has been a large immigration from the British Isles. Yet in spite of this large British-born population, more than one-fourth of the Canadian people speak French rather than English. This is due to the fact that the French-Canadians of Quebec, though they have been under British rule since 1763, retain the French language as the speech of everyday use. By the act of Parliament which established the Dominion in 1867, both French and English were made official languages of the Dominion Parliament and the Legislature of Quebec, and may be used in any federal court. In all provinces except Quebec English is the only official language.

A FOLKLORE TALE *of the* CANADIAN INDIANS

Wolf-Wind and the Children



THE Indians of Canada differed little from their red brethren in what is now the United States. But, through the wise protection of the Hudson's Bay Company and the less rapid development of the country, Canadian Indians are now more often found near their original homes; whence the better opportunity, now eagerly being seized upon, to study intelligently the picturesque myths and customs of these aboriginal Americans. The Glooskap of this story is the Canadian counterpart of the Gitchi-Manitou long familiar to American children in Longfellow's poem, 'Hiawatha'. Legend tells how he came across the great waters from the east, turning his stone canoe into an island until the time came for his return; how he created the beasts and the birds and all living things, including Man; how the Loon was his messenger and the Whale his ocean steed; and how Beaver and Bull-frog set themselves against his will and were punished therefor. The story of the creation of the Little Birds, which is here told, is only one of the interesting stories about Glooskap.

ONCE upon a time, long before the white men came to Canada, there lived a wicked giant who caused great trouble and sorrow wherever he went. Men called him Wolf-Wind. Where he was born no man knows, but his home was in the Cave of the Winds, far in the North Country in the Night-Night Land. There men knew he was hiding on calm days when the sun was hot and the sea was still, and on quiet nights when not a leaf or a flower or a blade of grass was stirring. But whenever he appeared, the great trees cracked in fear, and the little trees trembled, and the flowers bent their heads close to the earth trying to hide from his presence. Often he came upon them without warning and with little sign of his coming. Then the corn fell flat never to rise again, and tall trees crashed in the forest, and the flowers dropped dead because of their terror. And often the great waters grew white, and moaned or screamed loudly or dashed themselves against the rocks, trying to escape from Wolf-Wind. In the darkness of the night, when Wolf-Wind howled, there was great fear upon all the earth.

It happened once in those old times that Wolf-Wind was in a great rage, and went forth to kill and devour all who dared to come in his path. Many Indian families then lived near the sea, and the men and women fished off the coast. They caught fish to make food for the winter. They had gone far to sea in small canoes, for the waters had long been still and they thought there was no danger. The little children were left alone on shore. Suddenly, as the sun went down, without a sign of his coming, out of the North came Wolf-Wind, in his great rage, looking for prey and roaring loudly as he came.

"I am Wolf-Wind, the giant," he howled. "Cross not my path, for I will kill all the people I meet, and eat them up."

His anger only grew as he dashed along. As he came down upon the fishermen and fisherwomen, far out to sea, he splashed and tossed the waters aside in his fury. The fishers had no time to get out of his way or to paddle ashore. So quick was Wolf-Wind's coming that he caught them in his path and broke up their boats and killed them all. During all that night the giant raged about, looking for more victims.

"Suddenly out of the north came Wolf-Wind in his great rage. The fishers had no time to get out of his way. He caught them in his path and killed them all."

In the morning Wolf-Wind's anger was not yet spent. Far ahead of him he saw the little children of the fishers, playing on the shore. He knew they were alone, for he had killed their fathers and mothers. He resolved to catch them and kill them too. Roaring as he went, he dashed the waters against the rocks in his madness. As he came near to the beach he howled:

"I will catch you and kill you all, and eat you and bleach your bones upon the sand."

But the children heard him and ran away as fast as they could. They hid in a cave among the great rocks, and placed a big stone at the mouth of the cave so that Wolf-Wind could not get in. The giant howled loudly at the door, all day and all night long; but the stone was strong and he could not break it down. Then he went on his way, still very angry and still roaring; and he cried: "I will come back and catch you yet. You cannot escape from me."

The children were very much frightened and they stayed in the cave long after Wolf-Wind had gone. Far away they could hear him howling and crashing through the forest. They knew that Wolf-Wind had killed their fathers and mothers on the sea. When at last they came out they ran into the forest seeking a place where they could hide and be safe.

In Willow-Willow Land

So they went to the Willow-Willow Land, a pleasant country with grass and flowers and many streams. Between them and the North Country, where Wolf-Wind lived, were many great trees, with thick leaves, which they thought would protect them from the giant.

But one day Wolf-Wind, true to his promise, came again in a rage to find them. He came into the land killing all he met in his path. But he could not catch the children, for the trees, with their thick leaves, kept him away. The children heard him howling in the forest, far distant. For many days in the late summer he tried to find them. But their home was close to the trees and the great branches spread over them, and the thick leaves saved them; and only the Sun from the South, coming from the Summer-Flower Country, could look in upon them. Try as he did with all his might, old Wolf-Wind could not harm the children, though he knew that they were there. So they were always safe while they lived in the Willow-Willow Land.

Wolf-Wind became more angry than ever because of his failure, and his rage knew no bounds. He swore that he would have vengeance on the trees. So he came back again, bringing to his aid another giant from the North Country, who had with him a strange and powerful charm, the Charm of the

THE CHILDREN IN WILLOW-WILLOW LAND

"So they went to the Willow-Willow Land, a pleasant country with grass and flowers and many streams. Between them and the North Country, where Wolf-Wind lived, were many great trees, with thick leaves, which they thought would protect them from the giant. Try as he did, with all his might, old Wolf-Wind could not harm the children."

Frost. The two giants tried to kill the trees that had saved the little children. Over some of the trees they had no power, for when they came the trees only laughed, as they swayed and creaked, and said:

"You cannot harm us. We are strong, for we ourselves came at first from the Night-Night Land, in the far North Country; and over us the Charm of the Frost has no power." These were the evergreens —the Spruce and the Fir, the Hemlock and the Pine and the Cedar.

Takes Vengeance on the Trees

But on the rest of the trees Wolf-Wind took the vengeance he had vowed. When the harvest moon was shining in the sky he came without warning and, with the help of the Frost Giant, he killed all the leaves that had kept him from the children and threw them to the ground. One after one the leaves dropped from the Beech and the Birch, the Oak and the Maple, the Alder and the Willow. Some fell quickly, some fluttered slowly down, and some took a long time in dying. But at last all the broad-leaf trees stood bare and cold against the sky, and there was stillness and sadness in the forest. Then Wolf-Wind laughed and played through the leafless branches with the giant from Night-Night Land. And he said:

"Now I have overcome the leaves that kept me away; and when I please I can kill the children."

But the children only moved closer to the strong and sturdy evergreen trees that had come at first from the far North Country, and over which the Charm of the Frost had no power. And Wolf-Wind could not reach them, and they remained forever safe from the giants.

The children were very sad when they saw what Wolf-Wind had done to their friends of the hardwood forest. Summer had gone back to the Southland, following as she always did the Rainbow Road to her home in the Wilderness of Flowers. It was lonely in the forest, and silent. There was not a whisper in the trees. There were no leaves, for it was winter and Wolf-Wind had killed them all.

"The children hid among the great rocks and Wolf-Wind could not harm them. He went on his way, still very angry, and he cried: 'I will come back and catch you yet.'"

How Glooskap Brought Back the Leaves

At last the time of year approached when Glooskap, the Indian god who ruled the earth in those days, gave his yearly gifts to little children. He came on a sled drawn by his faithful dogs, to find out for himself what the children wished. And the children would all come to him, each asking for a boon.

Now Glooskap had great power upon the earth in that old time. The little children whom Wolf-Wind had tried to harm in his rage came to the Magic Master of Gifts, and they were all very sad because the leaves were gone from their forest friends.

"What do you wish?" said Glooskap.

"We wish nothing for ourselves," said the children. "But we ask that the leaves that were killed by Wolf-Wind be brought back to life and put again in their old places on the trees."

Glooskap Puts on His Thinking Cap

Glooskap was silent for a long time. He sat in thought, as was his custom; and he smoked hard at his mighty pipe, for he was a great smoker.

Now, at that time there were no little forest birds upon the earth, for Glooskap had not yet brought them into being. There were only the birds that dwelt near the sea, and over whom Wolf-Wind had no power—Seagull and Crane, Wild-duck and Loon, Kingfisher and Brant and Curlew. These only laughed when the giant raged, and screamed in mockery as they flew from him or hid among the rocks and the thick grass of the marshes. There were also the sturdy birds that dwelt with men and worked for them, giving them eggs and food—these were Hen and Goose and Duck and Wild Turkey. They gave men food, but they were not fair to look upon. They waddled along and could not fly well; and they made no sweet music upon the earth, for their song was but a quack and a cackle.

Why the Leaves were Changed to Birds

After Glooskap had smoked long in silence he hit upon a plan. He said to the children:

"I cannot bring back to the trees the leaves that Wolf-Wind has killed and stripped off, for it is now too late. But I will take the fallen leaves and change them into little birds. These will bring happiness to you on the days when Summer dwells in the land, with their pretty feathers and their pleasant songs. And the birds shall never forget how they were born. When Autumn comes they shall go with Summer far away to the Summer-Flower Land. But in the Spring they shall always come back, and they shall live as close as they can to the leaves from which they have sprung. They shall nest, most of them, in the trees under the leaves; and even those that nest in the grass love the trees and linger in them. And they shall all be beautiful in color like the leaves that gave them birth. They shall have power to rest at times upon the air like a leaf fluttering; and the voice of the air and the laughing waters shall be in their throats, and they shall sing sweet songs for little children.

"I give the children charge over them, to keep them from harm just as the leaves which gave them birth have saved the little children from the giants. And I will give the trees, that Wolf-Wind has stripped, power to bring forth new leaves every Springtime, so that when Summer comes back from the Wilderness of Flowers the trees shall not be bare. Though Wolf-Wind may strip off the leaves when the Frost Giant comes with him from the Night-Night Land, they shall always be replaced in the Spring. And I will take away much of Wolf-Wind's power, so that he can no longer harm little children as wickedly as he has done."

Long Yearly Journeys of the Birds

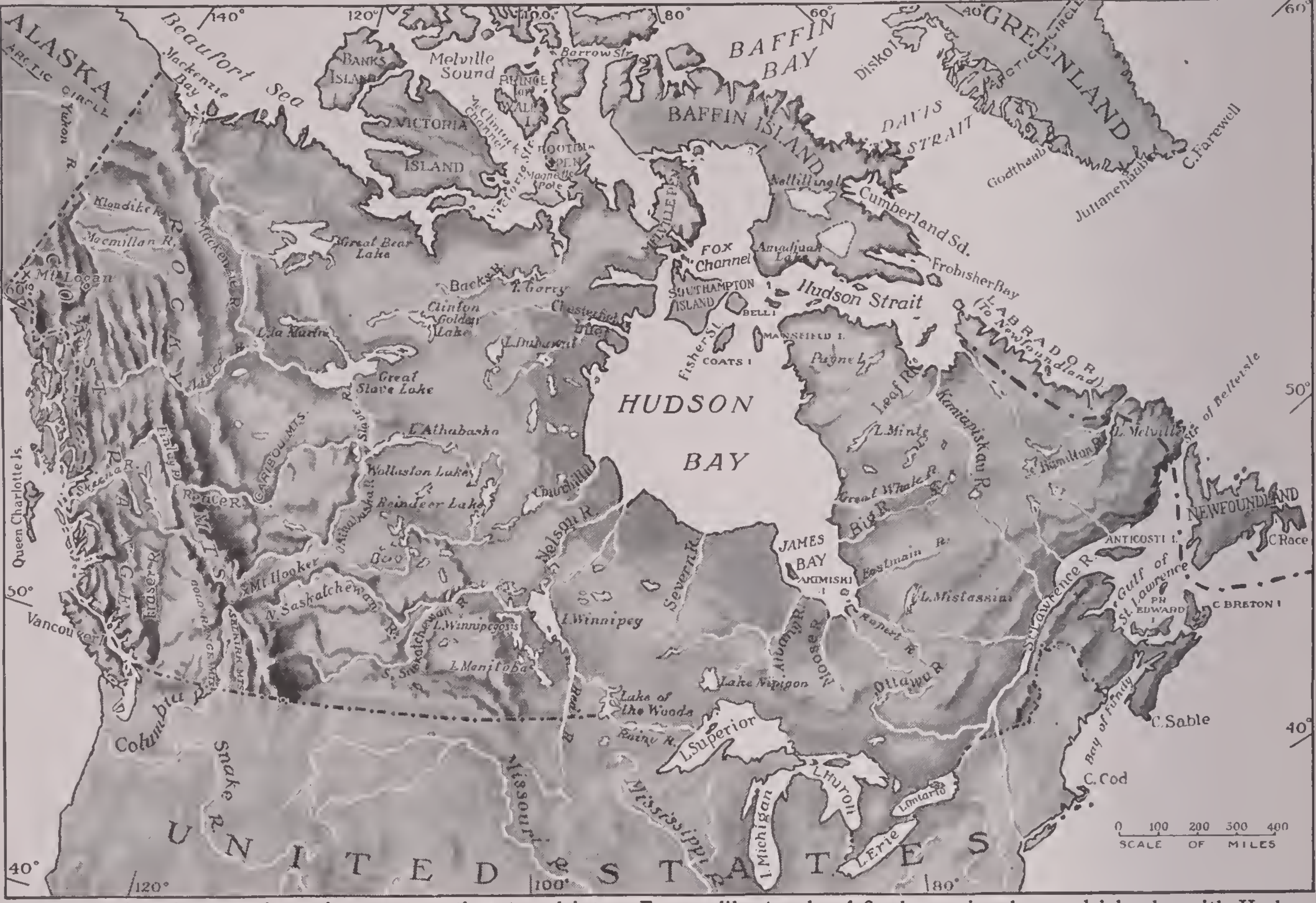
Then Glooskap waved his magic wand, as was his custom. At once great flocks of little birds sprang from the ground where the fallen leaves had lain. They twittered and sang in a great chorus and flew back to the trees. They were of beautiful colors, like the leaves that had given them birth. Among them were Robin Red-breasts and Thrushes, all brown and red from the red and brown leaves of the Oak. And there were Finches and Hummingbirds, all yellow and green and brown from the leaves of the Alder and the Willow; and they glowed like willows in the sunlight and fluttered like leaves upon the air. There were Yellowbirds and Canadian Warblers from the golden Beech and Birch leaves. And there were Scarlet Tanagers and Orioles and Grosbeaks, all of changing colors, red and purple and brown, from the leaves of the Canadian Maple. And they all sang to the children, and the children were very happy again.

Then Glooskap sent the little birds all away to a warm country, until the rule of the Frost Giant from the Night-Night Land was over; for it was Winter in the land and it was very cold. But in the Springtime the little birds always come back from the Summer-Flower Land. They build their nests among the trees, as close as they can to the leaves from which they came. And all day long they sing among the leaves for little children. At daybreak they wake the children with their choir of dawn, and at twilight they lisp and twitter to lull the children to sleep. But at night they hide among the leaves from the Wolf-Wind, and are very still with never a twitter or a song. For they do not forget that they are the children's gift from Glooskap, and that they come from the leaves which were stripped from the trees by Wolf-Wind, because the leaves had saved the little children from the giant long ago. (For other Indian animal stories, *see* Hare; Mouse; Whale.)—*From 'Fairy Tales from Canada', by Cyrus Macmillan.*

"Should you ask me, whence these stories?
Whence these legends and traditions,
With the odors of the forest,
With the dew and damp of meadows,
With the curling smoke of wigwams,
With the rushing of great rivers,

I should answer, I should tell you,
'From the forests and the prairies,
'From the great lakes of the Northland'."—LONGFELLOW.

THE VARIED SURFACE OF CANADA, A LAND OF OPPORTUNITY



The North American continent frays out northeastward into a Europe-like tangle of fiords, peninsulas, and islands, with Hudson Bay as its Mediterranean. Subtract Newfoundland and the Labrador coast, which form a separate colony, and Alaska; the remaining area nearly equals all Europe. This vast realm is the Dominion of Canada. The Laurentian Highlands, circling around Hudson Bay, fills nearly half its surface. The Lowlands of the St. Lawrence thrust a sharp elbow down among the Great Lakes. Facing the Atlantic and rimming the Gulf of St. Lawrence on the south is the Acadian Region, made up of southeastern Quebec and the Maritime Provinces. Westward, between the Laurentian Highlands and the Rocky Mountains, the United States boundary and the frozen Arctic coast, are the three terraces of the grain-growing Great Central Plain, a region of fertile soils and large lakes and rivers. Westward still to the Pacific is the Great Mountain area. Canada is truly an imperial domain.

The STIRRING STORY *of* CANADA'S PAST

CANADIAN HISTORY AND GOVERNMENT. The story of Canada's past has, in some respects, an interest and importance not always realized. From the standpoint of geographical exploration, not only is it full of picturesque and romantic detail, but it is the story of the opening up of a considerable fraction of the land surface of the earth; and from the standpoint of politics it is the story of a development without parallel in previous history. In that "galaxy of free nations" which has been well named the British Commonwealth of Nations, it was Canada that first achieved the status of a self-governing Dominion, that first reconciled colonial liberty with the imperial tie. The American Revolution, by means of which the 13 original British colonies in American gained their independence, broke up the Old British Empire; the Canadian Revolution—if one may apply that term to the long, gradual, and peaceful process by which Canada has won self-government—has not only *not* broken up the New British Empire, but has probably strengthened in a peculiar degree the vigorous racial bonds which bind it together.

The first Europeans to visit the shores of Canada were, so far as we know, the Northmen. These daring seafarers found their way to the northeast coast of North America, by way of Greenland, about the year 1000. Their visits, however, left no trace behind; and for practical purposes the discoverer of Canada was John Cabot, an Italian merchant—sailor in the service of the king, Henry VII of England, who sailed from Bristol and touched on what is now Canadian soil in 1497—a year before Columbus reached the mainland of North America farther south. Cabot, like Columbus, was in search of a sea-route to Asia; and when he did not find on the bleak coasts of North America the oriental silks and spices which he sought, he was bitterly disappointed. But though he did not find silks and spices, he found something no less profitable—the fish off the banks of Newfoundland. His son Sebastian, on his return to Europe, went so far as to report that the codfish were so numerous "they sumtymes stayed his shippes." As a result, fishermen from European ports began to come out to the Banks of Newfoundland and established a permanent link.

Once it became clear that America was not Asia, the aim of explorers came to be to find a way through that "Western Sea" which we call the Pacific Ocean. In this search they followed, so far as Canada was concerned, two routes. The French strove to push through by way of the St. Lawrence valley and the Great Lakes; the English endeavored first to discover a "Northwest passage" by way of Hudson Straits and the Arctic Ocean. Both efforts were eventually crowned with success. In 1534 a French mariner named Jacques Cartier penetrated up the St. Lawrence as far as Montreal. Two or three generations later, in 1615, Samuel de Champlain, the founder of Quebec, reached Lake Huron. Thence French missionaries and fur-traders made their way into Lake Michigan and Lake Superior, and into the country beyond. Between 1658 and 1660 two French *coureurs-de-bois*, Radisson and Groseillers, penetrated as far west as the Mississippi and the Great Plains; and in 1682 La Salle followed the Mississippi to its mouth. Before French domination in Canada had come to an end, in 1763, two of the sons of an intrepid western fur trader named La Vérendrye had actually sighted the foothills of the Rockies. When, therefore, Canada passed into British hands, there remained only one stage of the great process to be completed; and this was completed in 1793, when Alexander Mackenzie, a partner of the famous North-West Company, crossed the Rockies by the Peace River Pass and at last reached the Pacific.

EVANGELINE

This bronze statue of Evangeline in Grand Pré is the work of two eminent artists, Louis Philippe and Henri Hébert.

Meanwhile, farther north, English sailors had been searching for the "Northwest passage." In 1610 Henry Hudson had penetrated into the inland ocean which still bears his name; and the servants of the Hudson's Bay Company, which was formed in 1670 to trade in the territories about Hudson Bay, made some attempts to push farther westward. It was not, however, until the modern age of Arctic exploration that any real progress was made. In 1854 Sir John Franklin, a British naval officer who had explored a good part of the Arctic coast of Canada, perished in the attempt to reach the Pacific by water; and in the search for him ships coming from the Pacific met ships from the Atlantic—thus demonstrating the existence of the Northwest passage. Not until 1906, however, was it that Roald Amundsen, a Norwegian explorer, finally achieved the feat of bringing a ship all the way through from the Atlantic to the Pacific.

Settlement and Development of Canada

The story of the colonization or settlement of Canada can merely be touched on here. The first colonists were French. They settled mainly in Acadia (now Nova Scotia) and along the St. Lawrence, though they established trading-posts as far west as the Illinois River and the Great Plains. By the end of the French rule in Canada their numbers had grown to more than 60,000; and during the first years of the British rule it looked as though Canada were destined to become predominantly French.

What gave Canada an English-speaking population was the American Revolution. As a result of the Revolution, about 25,000 "United Empire Loyalists" were driven from their old homes, and forced to take refuge in the wilds of Nova Scotia, New Brunswick, and Upper Canada. This immigration was supplemented later by successive waves of immigration both from the British Isles and the United States; and, despite the fact that the original French population multiplied with exceeding rapidity, it was eventually outnumbered by the English-speaking elements. Not only the Maritime Provinces and Ontario (Upper Canada), but the Western Provinces have been settled mainly by people of English-speaking stock. A colony of Scotch Highlanders was founded in what is now Manitoba as early as 1812; and Vancouver Island, on the Pacific coast, was erected into a crown colony before the middle of the 19th century. The settlement of the greater part of the Canadian West, however, has been a much more recent matter. It has been only within the last half-century, since the building of the first transcontinental railway and the adoption of a vigorous immigration policy by the Canadian government, that the vacant spaces of the West have begun to fill up.

The political history of the Canadian people, in which French, English, and other elements have thus been mingled, has been full of interest. Though the French and the English in Canada have had occasional sharp disagreements, there are few countries in which peoples so different in language, religion, and traditions have, on the whole, gotten along so well together. And it is a remarkable fact that there is in existence in Canada today a strong national feeling—a feeling not English-Canadian, or French-Canadian, but all-Canadian.

There are few countries, moreover, whose annals present a more remarkable illustration of the growth of self-government. Not only during the period of French rule, but even under the first 30 years of British rule, Canada was governed in an arbitrary and despotic manner by officials sent out from the mother country. The inhabitants had no voice in the control of their own affairs. When, however, at the close of the American Revolution the United Empire Loyalists —people who had been accustomed in the American

PICTURESQUE QUEBEC FROM THE ST. LAWRENCE

Looking at picturesque old Quebec from a boat on the St. Lawrence, one is struck by the sharp division of the city into what is known as the Upper and Lower Town. The Lower Town, which lies along the river, looks much like some provincial town of France. Most of its streets are crooked and narrow, but it is still the principal wholesale business quarter of the city. On the heights of the Upper Town the streets are wide and well paved, and there are the better dwellings, the churches, the public walks, the gardens, and the retail shops. That impressive building on the right is the Hotel Frontenac, which is modeled after the old French chateaux.

colonies to a fairly advanced type of democratic government—flocked into Canada, a change became necessary; and in 1791 the Canadians, both English and French, were given popular assemblies composed of elected representatives. These assemblies, unfortunately, were granted such small powers that they became the centers of a violent reform agitation; and in 1837 the reformers, both in Upper and Lower Canada, broke out in armed rebellion.

The upshot of this rebellion was that British statesmen came to see that, so far at any rate as the domestic affairs of Canada were concerned, Canadians had to be allowed to govern themselves. Shortly afterwards, therefore, Canada was granted what is known as "responsible government"—that is to say, Canada became mistress in her own house. Almost immediately she began to adopt a distinctly independent attitude even toward the mother country. In 1859 she set up a tariff barrier against British goods. In 1862 Great Britain began to withdraw her troops from Canadian soil, and Canada began to take over the burden of her own defense. In 1908 Canada went so far as to assert her right to exclude from her ports immigrants from the British Isles. At the close of the World War it was announced that she was to have an ambassador of her own at the capital of the United States. There are still, it is true, a few limitations to the complete independence of the Canadian people; but these are purely nominal. For all practical purposes Canada is now as free as any country on the face of the earth.

Establishment of the Dominion Government

This development has been partly the result of another movement in Canadian history—the movement toward confederation or national unity. Up to 1867 the British provinces in North America were separated and disunited; but in that year Nova Scotia, New Brunswick, Canada East (Quebec), and Canada West (Ontario) agreed to unite in a confederation to be known as the Dominion of Canada. An act establishing the Dominion was passed by the British Parliament. Since 1867 the growth of the Dominion has been phenomenal. In 1869 it acquired by purchase the vast territories of the Hudson's Bay Company; and out of these there was carved in 1870 the province of Manitoba, and in 1905 the provinces of Saskatchewan and Alberta. In 1871 British Columbia, on the Pacific Coast, came into the Dominion; and in 1873 Prince Edward Island, which had refused to come in in 1867, repented of its decision, and followed British Columbia's example. Thus, within a few short years, Canada grew into a serried row of self-governing provinces stretching from the Atlantic to the Pacific. Newfoundland also still remains outside the Dominion.

Alongside these outstanding features of Canadian history, the details of the political history of the Dominion since 1867 are of only secondary importance, but they deserve perhaps a brief description. The first administration of the Dominion was that of Sir John Macdonald, a Conservative statesman who was one of the most outstanding of the Fathers of Confederation. In 1873, Macdonald was driven from power as a result of the "Pacific Scandal"—a scandal in connection with the building of the Canadian Pacific Railway. He was succeeded by Alexander Mackenzie, the leader of the Liberal party, who held office until 1878. In that year Macdonald was re-

PICTURE STORY OF CANADA'S THOUSAND YEARS

The Landing of Lief Ericsson and his Northmen (A.D. 1000)

John Cabot Discovers Newfoundland. (1497)

Jacques Cartier Explores the St. Lawrence (1534–36)

Champlain Founds a French Settlement at Quebec (1608)

General Wolfe Helps Win Canada for England (1759)

The Hudson's Bay Company Establishes Trading Posts (after 1763)

Loyalists from the United States Settle in Ontario (1783)

Rebellion in Upper Canada Wins Needed Reforms (1837)

Founding of the Dominion Government (1867)

Canadian Pacific Railway Completed (1885)

Peace River Country Opened Up to Settlement (1896)

500,000 Canadians Help Win the World War (1914–18)

The history of Canada is filled with stirring and important events, some of which you see depicted here. First come the era of discovery with its heroes—Lief Ericsson, John Cabot, Jacques Cartier, and the rest. Then come exploration, conquest, and settlement. Next we see political adjustment and the birth of the Dominion government. And finally we behold the land's prosperous development and political growth, vividly indicated by Canada's remarkable record in the World War.

turned to power on a high protectionist platform known as "the National Policy," and he remained in power, the most loved and most hated of Canadian politicians, until his death in 1891. For five years the conservative government he had headed then struggled on without him, under a succession of prime ministers; but in 1896 it was driven from power by the Liberals under Wilfrid (afterwards Sir Wilfrid) Laurier, a French-Canadian Roman Catholic. Laurier remained in office until 1911, when he was defeated on the issue of reciprocity in trade with the United States. A Conservative administration was then formed by Mr. (now Sir) Robert Borden; and it was this administration which guided the destinies of Canada in the first years of the World War.

The war effort which Canada made under Sir Robert Borden's leadership is perhaps the most glorious page in Canadian history. In 1917, in order to carry compulsory military service, Borden took into his cabinet representatives of the "conscriptionist" wing of the Liberal party; and the "Unionist" government thus formed remained in power until after the close of the war. Most of the Liberal ministers, however, left it, and Sir Robert Borden himself handed over the prime ministership in 1920 to Mr. Arthur Meighen, one of his former lieutenants. The party which Mr. Meighen headed adopted the name of "National and Liberal-Conservative"; but its chief support was still derived from the old Conservative party.

THE OLD CANNON AND THE WALLS

Did you notice that wall between the upper and Lower Town in the picture we have just passed? It was completed in 1832, and although it no longer has any value as a fortification, it is a part of the aspect of picturesque antiquity which one associates with Quebec. This picture shows one of several cannon of antique pattern mounted along the wall.

How Canada is Governed

To explain the system under which Canada is governed is not easy. Superficially, the government of Canada resembles that of the United States, on which it was to some extent modeled. In each case, two distinct sets of political machinery were set up, one central or federal, the other local or provincial, with a division of powers between them. Just as among the 13 original States of the American Union, so among the provinces of British North America local jealousies and interests prevented a complete union and compelled an arrangement under which each state or province would have control of its own local affairs. In each case, moreover, the federal senate or upper house was made the guardian of the rights of the smaller states or provinces, which were given in it especially generous representation. But here the resemblance between the two systems ends. In its essential features, the government of Canada is modeled on that of Great Britain—a system so different from that of the United States that the people of each country find it difficult to understand the political institutions of the other. This difference arises mainly from the fact that in Great Britain and Canada the executive government (that part of the government which carries out the laws) is directly responsible to the legislature (that part of the government which makes the laws); whereas in the United States it is not.

The political machinery of the Dominion is composed of: (1) a governor-general, who represents the British Crown and is appointed by the British government; (2) a cabinet of ministers, headed by a prime minister, which corresponds almost exactly with the British cabinet; and (3) a legislature or parliament composed of two houses—an upper house termed the Senate, which is, like the British House of Lords, not elected, but appointed, and a lower house termed the House of Commons, which is modeled after the House of Commons at Westminster.

The governor-general, as the representative of the Crown, is the nominal head of the government. Yet—and this is the deceptive feature of the Canadian system—he has virtually no powers of his own. In his official capacity he can do nothing except on the advice of his Canadian ministers. He has no veto on legislation, like the President of the United States; even the speech he makes at the opening of parliament is written by the prime minister. He is, in fact, little more than a figurehead—except that, in some

WHERE THE DOMINION'S LAWS ARE MADE

Built around three sides of a quadrangle, the Parliament House and other government buildings on Parliament Hill are the crowning architectural features of Ottawa, the beautiful Canadian capital. The most distant of the three towers shown is Victoria Tower, which rises 180 feet over the principal entrance to the Parliament Building. The building which formerly stood on this site was destroyed by a mysterious fire in 1916, while the World War was going on. This much larger fireproof building of the same Gothic architecture was immediately begun to replace it.

respects, he acts as a sort of ambassador from the British government.

It is the prime minister who is the real head of the government. He not only chooses the cabinet of ministers, or heads of departments, and thus controls the carrying out of the laws; he also very largely directs the making of the laws. This is because he is, and must be, himself a member of parliament, who is in command of the confidence of the majority of the House of Commons, the branch of the legislature that enjoys the all-important function of voting money. He and his cabinet sit in parliament and there render daily an account of their stewardship. The President of the United States and his cabinet do not sit in Congress, and during their term of office cannot be removed by Congress, except by impeachment; but the Canadian prime minister and his cabinet can be forced to resign at any time merely by the passing in the House of Commons of a vote of want of confidence. On the other hand, so long as the Canadian cabinet continue to enjoy the confidence of the House, they are practically masters of the situation; and the prime minister, as head of the cabinet, is little less than a dictator.

Great Power of the House of Commons

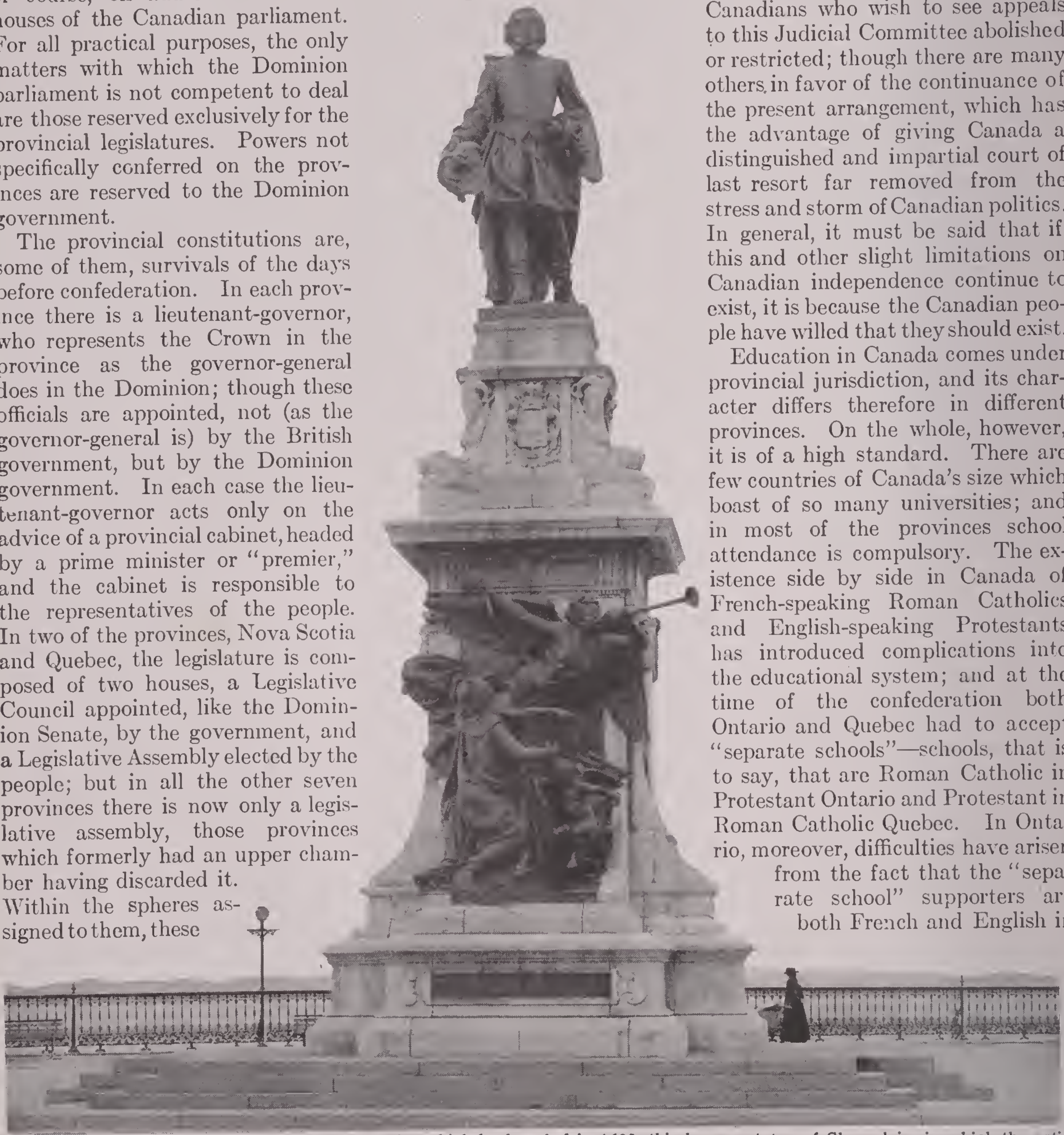
Of the two houses of parliament, the House of Commons is by far the more important and powerful. In it sit nearly all the cabinet ministers, and in it alone may bills be introduced which require the expenditure of public money. On its good will and support the very existence of the administration depends. The Senate, on the other hand, unlike the Senate of the United States, occupies in the constitution a distinctly inferior position. It was intended mainly as a revising chamber, in which hasty legislation passed by the lower house might be rejected or amended; but its action in this respect has been somewhat spasmodic. Owing to the fact that its members are appointed, virtually for life, by the government of the day, and that each government has been in the habit of appointing only its own partisans, the Senate as a rule has been very subservient toward the House of Commons when the party in power commands a majority in both houses, and very obstructive when, as usually happens after the advent to power of a new government, the dominant party in the House of Commons is in a minority in the Senate. So unsatisfactory, indeed, has the Senate proved that some observers have questioned whether it performs any useful function in the Canadian system; and there have been many proposals for its abolition or reform.

Within the sphere assigned to it, the Dominion parliament is supreme. Theoretically, the British government retains, under the British North America Act, which is the fundamental document of the

Canadian constitution, the power of disallowing Dominion legislation; but this power has not been exercised for many years, and it has now fallen into disuse. The British North America Act, it is true, can be amended only by the Imperial parliament; but this is now done, almost as a matter of course, on address from both houses of the Canadian parliament. For all practical purposes, the only matters with which the Dominion parliament is not competent to deal are those reserved exclusively for the provincial legislatures. Powers not specifically conferred on the provinces are reserved to the Dominion government.

The provincial constitutions are, some of them, survivals of the days before confederation. In each province there is a lieutenant-governor, who represents the Crown in the province as the governor-general does in the Dominion; though these officials are appointed, not (as the governor-general is) by the British government, but by the Dominion government. In each case the lieutenant-governor acts only on the advice of a provincial cabinet, headed by a prime minister or "premier," and the cabinet is responsible to the representatives of the people. In two of the provinces, Nova Scotia and Quebec, the legislature is composed of two houses, a Legislative Council appointed, like the Dominion Senate, by the government, and a Legislative Assembly elected by the people; but in all the other seven provinces there is now only a legislative assembly, those provinces which formerly had an upper chamber having discarded it. Within the spheres assigned to them, these legislatures are supreme. They have even complete oversight of the system of municipal government, which is everywhere based on the principle of popular election; and they determine the form of the provincial courts. Like the United States, Canada has a Supreme Court for the whole country. The final court of appeal for Canada in the more important cases is not, however, this court, but the Judicial Committee of the Privy Council in England—a curious survival of Canada's former colonial status. There are not a few Canadians who wish to see appeals to this Judicial Committee abolished or restricted; though there are many others in favor of the continuance of the present arrangement, which has the advantage of giving Canada a distinguished and impartial court of last resort far removed from the stress and storm of Canadian politics. In general, it must be said that if this and other slight limitations on Canadian independence continue to exist, it is because the Canadian people have willed that they should exist.

THE SPIRIT OF CHAMPLAIN IN BRONZE



Standing high upon its marble pedestal in the city which he founded in 1608, this bronze statue of Champlain, in which the artist seems to have embodied the very spirit of the intrepid colonizer and soldier, overlooks the broad St. Lawrence which he explored up to the Falls of St. Louis and down to Gaspé in 1603. The statue stands at the eastern end of the magnificent promenade called Dufferin Terrace in Quebec. This terrace is 1400 feet long and 200 feet wide, overlooking the majestic river.

Education in Canada comes under provincial jurisdiction, and its character differs therefore in different provinces. On the whole, however, it is of a high standard. There are few countries of Canada's size which boast of so many universities; and in most of the provinces school attendance is compulsory. The existence side by side in Canada of French-speaking Roman Catholics and English-speaking Protestants has introduced complications into the educational system; and at the time of the confederation both Ontario and Quebec had to accept "separate schools"—schools, that is to say, that are Roman Catholic in Protestant Ontario and Protestant in Roman Catholic Quebec. In Ontario, moreover, difficulties have arisen from the fact that the "separate school" supporters are both French and English in point of language, whereas the official language of the province is English. But these difficulties are not impossible of solution, nor do they seriously affect the efficiency of the educational system.

POETRY AND PROSE *of the* CANADIAN DOMINION

IT IS sometimes said that Canada has no literature of her own, and that the term Canadian literature means merely English literature written in Canada. But even though Canadian literature is written in the English language, it is distinctively Canadian in its character and its ideals, distinctively Canadian too in its setting and its general spirit. It seeks to give expression to Canadian life and aspirations, and its atmosphere differs greatly from that of the literature of the Old Country. As is shown in this article, its quantity for a young country is surprisingly large and its quality of unusually high merit.

CANADIAN LITERATURE. During the early years of occupation, after the fall of Quebec in 1759, Canadians had little time to devote to literary production; they were too busy felling forests, clearing rocky hillsides, and building homes. Until the close of that century there was only a scanty output of books in Canada, but it was in those pioneer days that Canadian literature really came into being. Naturally the literature of that period deals with the life of the first colonists and immigrants, and gives the record of their hardships and struggles. Here mention should be made of the first Canadian novel, the 'History of Emily Montague' (1769) by Mrs. Frances Brooke, wife of Rev. John Brooke, a chaplain in the garrison at Quebec, which gives in letter form an interesting description of Canadian life and scenery in those early days. Interesting and valuable also is the account given by Sir Alexander Mackenzie of his explorations to the Arctic in 1789 and to the Pacific in 1793, described in his 'Voyages from Montreal through the Continent of North America'. His descriptions of the Peace River country and of the Rockies have real literary merit. Alexander Henry, a fur trader, in his 'Travels and Adventures in Canada and the Indian Territories' (1809) gives a graphic pen picture of Pontiac's War.

With the close of the century and the rapid development of the country, literary production greatly increased. The first native Canadian novelist was John Richardson, whose 'Wacousta' (1852), based on the tales and traditions of the country, is largely in imitation of James Fenimore Cooper. Mrs. Susanna Moodie's 'Roughing It in the Bush' (1852) and 'Life in the Clearings' (1853) give an accurate picture of the hardships of the pioneers in early days.

Thomas Chandler Haliburton (1796–1865) is perhaps the most noted figure in Canadian literature. He was opposed to Canadian self-government and responsible government as advocated by the leaders of the rebellion of 1837, and his 'Bubbles of Canada', and his 'Rule and Misrule of the English in America' attempt to analyze the situation. His 'Clockmaker' (1837) gives the observations and wise sayings of "Sam Slick," a shrewd Yankee peddler who sells his wares in Nova Scotia. Haliburton satirizes the lack of energy and initiative in his native province, the narrowness of the average Englishman, and the weaknesses of the people whom the clockmaker meets. It is a book of sly humor and subtle character drawing, and "Sam Slick" is one of the immortal figures in the literature of the New World.

During the first half of the 19th century no poetry of importance appeared in Canada. Charles Sangster (1822–93) may justly be called the first Canadian poet of merit. His verse shows a deep insight into Nature and her varied moods, and his volume 'Hesperus and Other Poems' (1860) sounds a new national note of patriotism and appreciation of Canadian scenery. 'A Song for Canada' and 'The Rapid' are his best-known poems.

Charles Heavysege (1816–76), author of the poetic drama 'Saul', and Thomas D'Arcy McGee (1825–68), author of 'Canadian Ballads', wrote verse of rare beauty, but although they lived in Canada they are not distinctively Canadian in their work. The former was English; the latter was Irish, even to the extent of participating in his youth in an abortive Fenian rebellion in Scotland.

In the period before and during the Confederation struggles, pamphlets and political addresses abounded, all on a plane of high national aspiration. The speeches of Joseph Howe and of George Brown set forth the political problems and the difficulties in the way of the successful attempt to make a new and united Canada by confederating the various provinces. After Confederation had brought about a united Dominion, a new national spirit became apparent in Canada's literature. There was a greater desire to interpret Canadian life and a distinctively Canadian civilization.

A Growing Wealth of Poetry

To this period belongs the first Canadian poetry of importance; indeed the largest part of Canadian literature dates from Confederation. It is of comparatively recent growth, the product of a united country and the expression of united national feeling rather than of scattered states. Charles G. D. Roberts (1860–) in his first volume (published in 1880) wrote verse of a high order, no longer provincial, and differing in its classical polish and its music from previous attempts at poetry in Canada. His later work has much that is distinctively Canadian, and his 'Songs of a Common Day' contains verse that will compare with the best of English poetry.

Archibald Lampman (1861–99), who has been given by many critics the first place among Canada's poets, wrote poetry which interpreted the beauty in the common things of life. He depicted nature with an artist's hand, and he opened the eyes of his readers as no other Canadian poet has done to the beauties of the fields and streams and woods of his native country. He was a master of the sonnet form, and his verse in 'Among the Millet' (1888) and 'Lyrics of Earth' (1896) has frequently been compared with that of Keats.

Bliss Carman (born 1861) dealt with Canadian themes only in his earlier verse; much of his later work is Canadian in its color, although he has broadened the scope of his subject from descriptions of nature to the wider themes of the mysteries of life and of destiny. From his 'Low Tide on Grand Pré' (1893) to his 'April Airs' (1916) he was written several volumes of rich melodious verse, in which the 'Pipes of Pan' is perhaps the best known poem.

The life and soul of Canada's first inhabitants, the Indians, were best interpreted by Pauline Johnson (1862–1913), the daughter of an Indian father and an English mother. She loved Canada deeply and tried to convey in her verse some notion of its greatness, the vastness of its prairies, the grandeur of its rivers and lakes, the majesty of its great silent places. She wrote lyrics of lilting music that sing themselves into the memory, and her poem, 'The Song My Paddle Sings' is well known to Canadian children.

The French-Canadian in Literature

In 'The Habitant' William Henry Drummond (1854–1909) gave a sympathetic interpretation of the homely kindly character of the French-Canadian farmer and woodsman. His varied characters are familiar figures, and every Canadian school-boy knows the crew of the river-scow *Julie Plante*.

Robert Service (born 1874) in his 'Songs of a Sourdough' (1899) achieved great popularity because of his vivid descriptions of the rugged scenery of the Arctic land, and of the rough and adventurous life of the mining regions and the trails of the Far North country. He had lived the life he described, and he knew that—

> There are strange things done in the midnight sun
> By the men who moil for gold;
> The Arctic trails have their secret tales
> That would make your blood run cold.

While his verse lacks fineness, he describes with a thrilling and fascinating masculine force and great dramatic intensity the tragedy and the comedy of a pioneer land.

The World War brought forth many volumes of Canadian verse, but few of the poems are of merit. Robert Service's 'Rhymes of a Red-Cross Man' appeal to fighting men. 'A Canadian Twilight', a small volume written by Bernard Freeman Trotter just before he was killed in action, contains unusually good verse; and 'In Flanders Fields' by John McCrae, who died at the front, will live because of its pathetic beauty and because of its call from the dead to future generations to be mindful of the principles for which Canadian soldiers died:

> To you from falling hands we throw
> The torch; be yours to hold it high;
> If you break faith with us who die
> We shall not sleep, though poppies grow
> In Flanders Fields.

Among other recent Canadian poets who have produced work of distinction are Marjorie Pickthall, whose 'Drift of Pinions' has given distinction to later Canadian verse, Frederick George Scott, Duncan Campbell Scott, and William Wilfrid Campbell.

Notable Novels and Tales in Prose

Just as there was a new interest in poetry after Confederation, so there was a notable development of prose fiction. Gradually the novels produced turned away from the purely provincial and endeavored to interpret national life. In 1877 William Kirby (1817–1906) wrote 'The Golden Dog', a historical romance in which he discussed with accuracy and power the final struggle between the French and the English for the possession of America. In the manner of his plot and in his fidelity to local color and to correctness of detail he was influenced by Scott and by Dumas. 'Spanish John' by William McLennan is a Canadian novel notable for its style, its characters, and its stirring incidents.

Sir Gilbert Parker's earlier books are Canadian in theme and in setting. In 'The Seats of the Mighty' (1896) he gives a romance of old Quebec, in which historical characters who had a prominent part in the making of Canada are made to live again amidst scenes depicted with accurate detail. His later work is not Canadian (*see* Parker, Sir Gilbert). Another Canadian historical novel of importance is 'In the Midst of Alarms', a story of the Fenian Raid written by Robert Barr (1850–1912).

The Rev. Charles W. Gordon ("Ralph Connor") (born 1860) gives in his novels a picture of the life of the Canadian West, and of the development of that new country. His 'Black Rock', 'The Sky Pilot', and 'The Foreigner' have vivid glimpses of virile men in action in a pioneer world.

The Newfoundland and the Labrador coasts, with their rocky cliffs and barren shores, are the scenes of the novels of Norman Duncan (1871–1916). With mingled pathos and humor, with vivid and sympathetic power, he portrays the fisher folk and the traders of that bleak country, and his 'Dr. Luke of the Labrador', 'The Cruise of the Shining Light', and 'The Adventures of Billy Topsail', are all healthy manly books, abounding in adventures.

Stirring Animal Stories

Charles G.D. Roberts, already spoken of as a poet, has written animal stories that have a strong appeal for boys and girls. In 'Red Fox', 'Kindred of the Wild', and 'Watchers of the Trail', he gives us his best studies of animal life. In 'Anne of Green Gables' and other Anne books, Lucy Maud Montgomery (Mrs. Ewan Macdonald, born 1874) has given us a delightful picture of schoolgirl life, with a setting in Prince Edward Island. Among the younger Canadian writers of fiction are Arthur Stringer and Basil King (neither of whom is now distinctively Canadian), Frank Packard, whose 'Miracle Man' has had wide success, and Robert J. C. Stead, author of 'Dennison Grant' and other "best sellers."

In humor the outstanding Canadian writer is Stephen Leacock (born 1869). Although he is Canadian, his work is not local in scope, for his satire of human weaknesses and hypocrisies applies to all lands and to all societies.

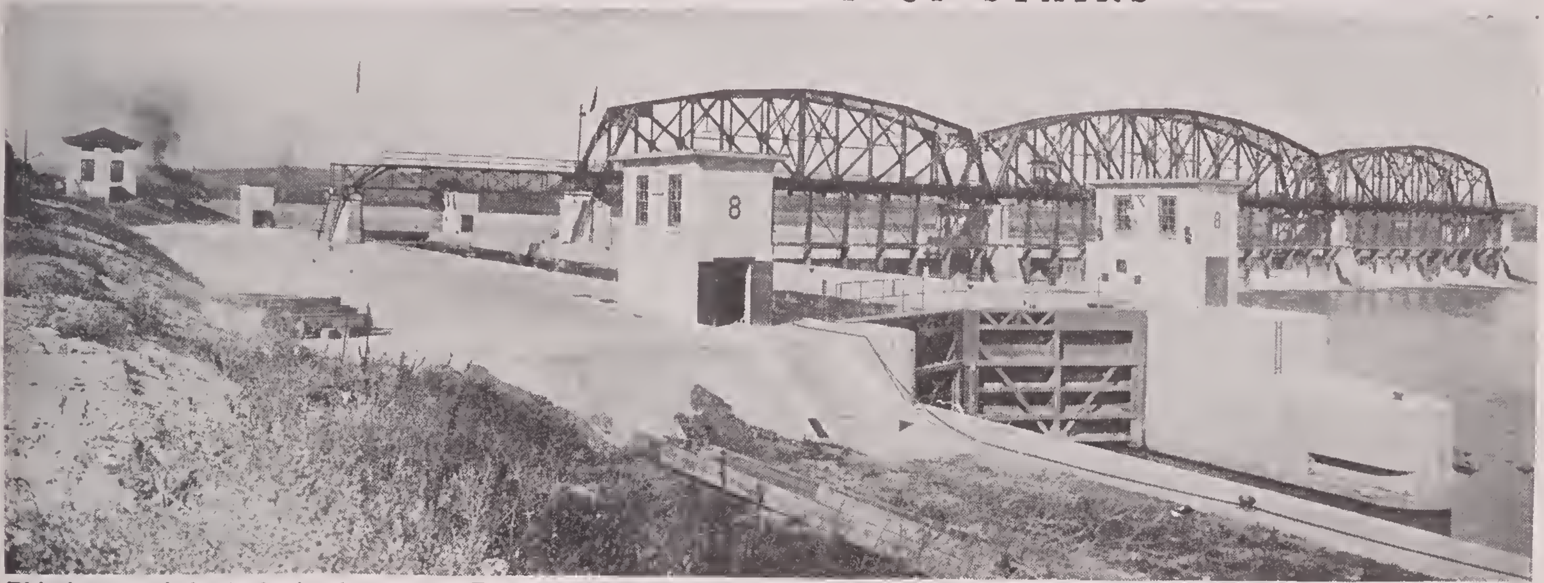
During recent years there has been a new and deepening interest in Canadian folk-tales, folk-songs, and fairy tales. Since the beginning of the present century there has likewise been a new interest in history, particularly the story of Canada's birth as a British Dominion, and a profound curiosity about the early exploration days. The minds of the people have been turned back to the trials and adventures of their ancestors. Seemingly they have acquired a greater pride in their heritage as Canadians, and are more eager than before to investigate the early records of their country. The result has been the publication of a large body of literature expressive of this new movement. 'Quebec Under Two Flags' and the 'Cradle of New France' by A. G. Doughty, together with 'The Siege of Quebec' by A. G. Doughty and G. W. Parmelee, recall the too-often forgotten fact that Canada is the child of two parents—one English, the other French. Descriptive of exploration are J. W. Tyrrell's 'Across the Sub-Arctics of Canada', Lawrence J. Burpee's 'Search for the Western Sea', the best historical account of the work done by early Canadian explorers, and Agnes Laut's 'Pathfinders of the West' and 'Vikings of the North'. All these books are of inestimable value to the girls and boys of Canada.

We omit from this sketch the work of the noted historian Goldwin Smith (1824–1910) who although long a resident in Canada was not a native of the country, and whose work was not distinctively Canadian in character.

In the drama Canada has as yet produced comparatively nothing. In general literature a new national note has appeared. As a result of the war Canada has "found herself"; she has come to realize her nationhood and her destiny. Her future literature will be an expression of her new national life in a new country, and it will be true to the spirit of her ancestors—the pioneers who founded a new civilization, distinct from that of the Old World. It will be true, too, to the highest ideals of the Anglo-Saxon race. So the future of Canadian literature is a future of promise.

CANALS. Artificial waterways or canals were developed at a very early date, both for transportation and irrigation. The Chinese, as early as the 5th century B.C. had begun work on the Grand Canal of China, between Hangchow and Peking, which, with a total length of 1,000 miles, is said to be the longest as well as the oldest existing canal. The principal part was built in the 13th century after Christ, and the whole canal is now being modernized. About 2000 B.C. the Egyptians built a canal joining the Nile and the Red Sea, thus anticipating the modern Suez Canal. Later Nebuchadnezzar built the royal canal of Babylon, connecting the Tigris and the Euphrates. The Romans constructed canals as well as roads in many parts of their empire. Charlemagne about the 8th century began a system of canals to connect the Rhine, the Maas, and the Danube.

HOW BOATS FLOAT UP STAIRS



This is one of the locks in the famous Erie Canal. In going upstream, the freight barge enters the lock basin through these two swinging gates in the foreground. The gates close and water is admitted through great openings at the bottom of the basin, until the water level in the lock equals that of the canal above the lock. Then the upper pair of gates open and let the barge pass on its way.

Later ages saw the development of extensive canal systems in Italy, Belgium, France, and elsewhere in Europe, as well as in Asia. The Languedoc Canal, or Canal du Midi, joining rivers which flow respectively into the Bay of Biscay and the Mediterranean, made Spain and Portugal an island. It was finished in the time of Louis XIV (1681). The most extensive engineering work ever undertaken in Europe up to that time, it is regarded as the pioneer of modern European canals. With it France began that policy of canal construction which has provided her with more than 3,000 miles of canals to add to her 4,600 odd miles of navigable rivers. The Languedoc Canal, about 6½ feet deep and 148 miles long, rises 620 feet above sea level with 119 locks.

The second half of the 18th century saw great activity in canal-building in Great Britain, to transport coal and other bulky commodities, and this continued unabated until the introduction of railways, 75 years later. The Manchester Ship Canal, between Manchester and Liverpool, is a noted example of how waterways may be constructed to join an inland city with the coast. This canal, the most important in the British Isles, makes the great manufacturing city of Manchester a seaport, though it is 35 miles from the coast. There are four sets of locks, each set consisting of a small and a large lock side by side. Probably the most interesting feature of this work is a swing-bridge, which carries the old Bridgewater Canal (1759) over the new Manchester waterway. This is a great steel trough 19 feet wide, 6 feet deep, and 234 feet long, which may be closed off from the rest of the overhead canal and swung about an axis, so that boats may pass by in the lower canal.

Nearly all the thickly settled parts of Europe are now covered with a network of artificial waterways, which are of great importance in cheapening freight rates. The canals of Holland, built primarily to provide channels for the water drained from the low-lying land, are also valuable for transportation. All the larger river systems of North Germany and of Russia are connected. The Russians have been active in Asia, too, making it possible for boats to pass all the way from the Ural Mountains to Lake Baikal in the heart of the continent.

In the earliest times boats were propelled through canals by man-power; then horses and mules were used on a towpath along the bank. Driving mules along a towpath, it will be remembered, was a boyhood occupation of one of the American presidents—James A. Garfield. Today boats move either by their own power, are drawn by small steam tugs, or are hauled in the old-fashioned way by mules or horses.

LOOKING INTO A LOCK FROM A CANAL BOAT

The lower lock gates have swung back into niches in the lock walls where the boat cannot strike them. At the other end of the lock basin you see the upper gates which will open after the boat is safely inside and the water level is raised as described in the preceding page These gates are operated by powerful electrical machinery, which swings them back and forth as easily as you close a door.

Until the invention of the canal lock in the 14th or 15th century, canals could be built only where the country was level. A lock is a device for raising or lowering a boat from one water level to another. It consists of an artificial basin with a pair of gates at each end. In going upstream the upper pair of gates remains closed and the boat proceeds into the lock. The downstream gates are then closed, and water is admitted so as to raise the boat to the upper level. The process is reversed when the boat is going downstream.

Canals can be broadly classified as inland or barge canals and oceanic or ship canals. The Suez and Panama canals are examples of the latter type (*see* Suez Canal; Panama Canal). They generally provide a short route between oceans and seas, in place of long and hazardous routes which boats formerly had to take. Included in this group are the Corinth Canal, connecting the Gulf of Corinth and the Saronic Gulf or Gulf of Aegina in Greece; and the Kiel Canal (60 miles long) between the Baltic and North seas. Built by Germany for aggressive military purposes as well as commerce, and now internationalized, the Kiel Canal enables even the largest vessels to escape the great detour around the peninsula of Denmark.

George Washington might be called the father of canal construction in the United States, for he was the first conspicuous advocate of canals to connect the water systems of this country. He was especially interested in the Chesapeake and Ohio Canal, extending from Washington, D.C., 185 miles to Cumberland, Md. Completed in 1850 at a cost of more than $11,250,000, it is one of the oldest in the United States. By means of about 75 small locks it gains a total elevation of more than 600 feet, the water being supplied by the Potomac River.

In the first half of the 19th century a very extended system of state-aided "internal improvements," including canals, was proposed; but of the 5,000 miles of canals planned, less than 3,000 miles were constructed, and many of these have since been abandoned. The competition of the steam railway, following 1850, caused the decline in canal building; but in recent years there has been renewed interest in water transportation.

The Cape Cod Canal was built in 1904–14 across the narrow strip where Cape Cod joins the mainland of Massachusetts. Leading directly from Massachusetts Bay into Buzzards Bay, this canal saves 66 miles in the trip from Boston to New York, besides making it possible to avoid the treacherous shoals of Nantucket. The "Soo" canals at Sault Sainte Marie, which make navigation possible between Lake Superior and Lake Huron, form a link in the Great Lakes system and are of vast commercial importance (*see* Sault Sainte Marie).

The World War stimulated interest in inland canals owing to the inability of the railroads to carry the enormous burdens placed upon them. The New York State barge canal proved particularly useful. This system, which comprises the old Erie and three other canals formerly operated individually, was reconstructed by New York State in 1903–17 (*see* Great Lakes; New York). The principal section is the Erie Canal, extending from Buffalo 383 miles eastward to Troy and Albany, and connecting Lake Erie with the Hudson River. Completed in 1825 at a cost of $7,602,000, the Erie Canal has the longest record of continuous operation. Its completion marked a new era in the commercial expansion, not only of New York, but of the country. The industrial and financial supremacy of New York City was largely based on the successful operation of this canal. It has been enlarged and improved to meet increasing traffic. The old machinery has been replaced by most modern devices. Where the old canal laboriously climbed a steep hill at Lockport in a flight of five small locks, the new canal "takes" the hill in two steps.

The recent revival of interest in water transportation has resulted in a number of new projects all over the country. Work was begun in several middle western states, notably Illinois, to complete a waterway available for large boats from the Great Lakes to the Gulf via the Mississippi River. In this project the Chicago Drainage Canal, which as the name indicates was originally built for drainage, is a factor. The Chicago River formerly emptied into Lake Michigan, polluting Chicago's drinking water, but by the expenditure of $63,000,000 it was made to flow in the other direction, and the water is carried into the Mississippi via the Des Plaines and Illinois rivers by means of the drainage canal, completed in 1900. Thus Lake Michigan now has an outlet into the Gulf of Mexico. This canal, one of the greatest of all municipal achievements, has had a far-reaching effect on both the health and commerce of Chicago.

The outstanding feature of water transportation in Canada is the St. Lawrence system of rivers and lakes stretching from the Strait of Belleisle to the head of Lake Superior. Three important links in this system are one of the Sault Sainte Marie canals connecting lakes Superior and Huron, the Welland Canal, connecting Lake Erie and Lake Ontario, and the four St. Lawrence canals, built to facilitate navigation around the rapids of the St. Lawrence River above Montreal. (*See* Great Lakes; Welland Canal.)

The Rideau-Ottawa canal system was designed to provide safe water communication between Kingston and the lower St. Lawrence by way of Ottawa and the Ottawa River. Originally built chiefly for military purposes, it formed a "back door" between the two great rivers. The Ottawa River canals number four. The Rideau Canal, formed by canalizing the Rideau and Cataraqui rivers and making use of the Rideau Lakes, was opened in 1833. It has four locks.

The Trent River has been improved from the Bay of Quinte to Lake Simcoe. Two great hydraulic lift locks have been constructed. One of them is the largest in the world. It can lift a vessel of 800 tons' capacity 65 feet vertically. The Trent Canal improvements were made as a part of Canada's project for a navigable waterway more than 200 miles in length, connecting the rivers and lakes across the narrowest part of lower Ontario between Georgian Bay in Lake Huron and the Bay of Quinte in Lake Ontario, and thus avoiding the long route down through the Detroit River, Lake Erie, and the Welland Canal.

CANARY BIRD. Would you pay $75 for a pet bird no larger than a sparrow? If it were a Harz canary you might have to pay even more. These little singers are famous the world over for their song power, and in the Harz Mountains of Germany their breeding is an important household industry. An especially fine songster is often used to train the young birds. Such bird teachers are called "campaninis."

Canaries as cage-birds were introduced into Italy from the Canary Islands in the 16th century. They are now common household pets in all parts of the world. They belong to the finch family and in their wild state are gray or greenish yellow. The mother canary builds the nest and hatches the babies from her four or five blue eggs, but the father bird does most of the feeding.

The yellow plumage of the tame canary is produced by special breeding. Some canaries are bred more for their beauty than for song power. Of these, the gold- and silver-spangled canaries are considered handsomest. Another rare variety is the *cayenne canary*, the brilliant red of its feathers being due to careful feeding with red pepper.

Canaries must be regularly attended to and the cage kept scrupulously clean. The best food is grass seed, some hemp seed, and greens. Lime is necessary and the birds find just the right kind in cuttlefish bone. Fresh drinking water must be kept in the cage and a bird bath provided frequently. The perch must be no thicker than a lead pencil, so that the toes of the little feet can grasp it easily. Scientific name of the canary, *Carduelis canaria.*

CANARY ISLANDS. The first glimpse of the Canaries is frequently the single snow-covered peak 12,000 feet high which dominates the island of Teneriffe, and which in clear weather can be seen at sea for many miles. It is a partially extinct volcano, and the natives thought it was the dwelling place of the evil one. Drawing nearer to the islands, the boat makes its first landing at Santa Cruz, also in Teneriffe, which is the Spanish capital. The white flat-roofed houses make a dazzling picture under the tropic sun, and presently we see that the trees and shrubs are those of hot climates—date palms, orange trees, bananas, and cactus. The swarthy loafers along the quay and the handsome black-eyed girls suggest southern Spain, for the Spaniards have intermarried with the original native population to such an extent that it is impossible to distinguish any of the descendants of the ancient Guanchos.

Today the Canary Islands remain as one of the few possessions of the once mighty empire of Spain. Modern commerce has made them prosperous, but they still have a dreamy Old-World charm, and everywhere there are ancient monuments and castles that recall the fierce conflicts with the Guanchos, and the time when richly laden galleons used to stop at the islands on their way from the New World to Spain. And everywhere is the same contrast, so frequent in Spanish-speaking countries, typified in the narrow street where ox-cart and electric street-cars alternate.

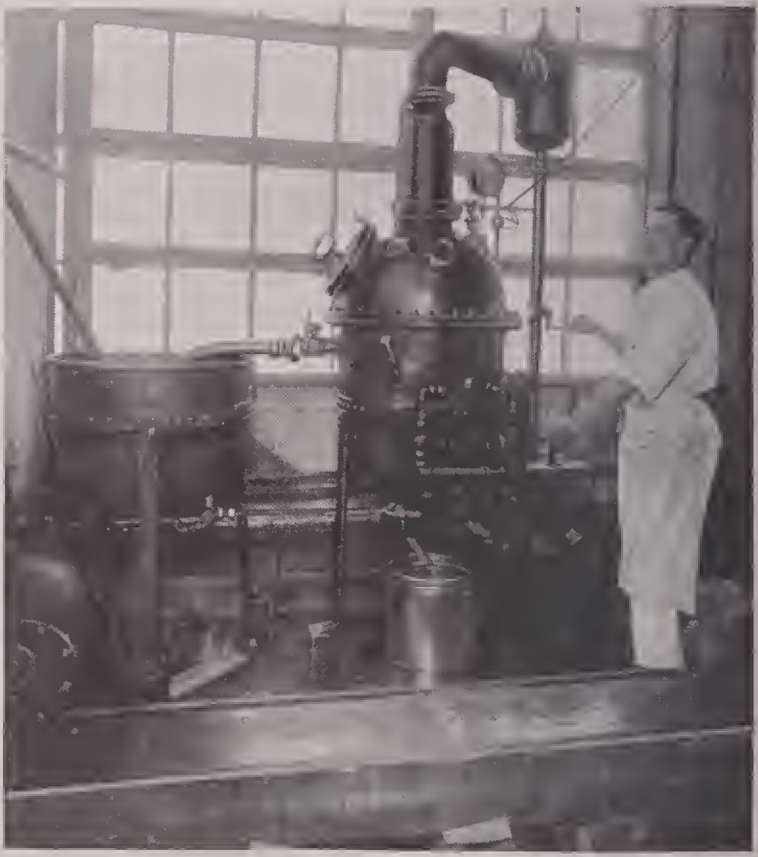
The Canaries comprise seven principal islands—Teneriffe, Grand Canary, Palma, Hierro, Gomera, Lanzarote, and Fuerteventura—besides a number of small uninhabited islands. It is thought they may be the "Fortunate Isles" or "Isles of the Blest" which were often referred to in Greek and Roman legends, and their existence was probably known to the Phoenicians and Carthaginians. They were not rediscovered, however, till the 14th and 15th centuries. The chief products today are potatoes, onions, cochineal, tobacco, wine, sugar, and fruits. The islands are volcanic in origin and lie about 60 miles from the northwest coast of Africa. The total area of the larger islands—2,835 square miles—is a little more than that of the state of Delaware, and the population (about 510,000) twice as great.

CANBER'RA, AUSTRALIA. Like the city of Washington, this capital of the Commonwealth of Australia is an artificial creation. Just as our constitution authorized the choosing of a federal district to become the seat of government of the United States, so the constitution of the Commonwealth of Australia, adopted in 1900, provided for a new capital which should be separate from the capital of any state. After nearly ten years a site in New South Wales, in southeastern Australia, was chosen as the territory within which the new city was to be erected. It includes 900 square miles, and in addition two square miles on Jervis Bay for a port and naval college.

The plan accepted for the new city, in 1912, was based upon designs submitted by Walter Burley Griffin, a Chicago architect, in a competition open to all the world. It presents a pleasing picture of hills crowned with beautiful buildings, and lowlands bordering a great artificial lake made by damming the sluggish waters of Molonglo River. Along the shores of the lake, and stretching far back, is an area of parklands unequaled in any other city of the world. On the summit of the ridge overlooking the valley stands the capitol building, and on a minor spur, just below, the houses of parliament. The chief residential quarter lies on the southern hills behind the capitol, well back from the valley. To the right and in front of the capitol are public offices; to the left, official residences. Across the valley are university buildings, hospitals, etc., on the lower ground, with a residential suburb higher up to the north. The industrial section of the city is relegated to the upper end of the lake. The plans contemplate a permanent population of 25,000.

CANDY. When the children who lived a century or so ago saw a sweetmeat that looked like our candy, the first thing they thought of was—what do you suppose? Medicine! Because in the old days, what we call candy was made only by druggists and was used almost entirely to coat little pills and disguise the bitter taste, just as we today coat pills of quinine and other bitter medicines with chocolate.

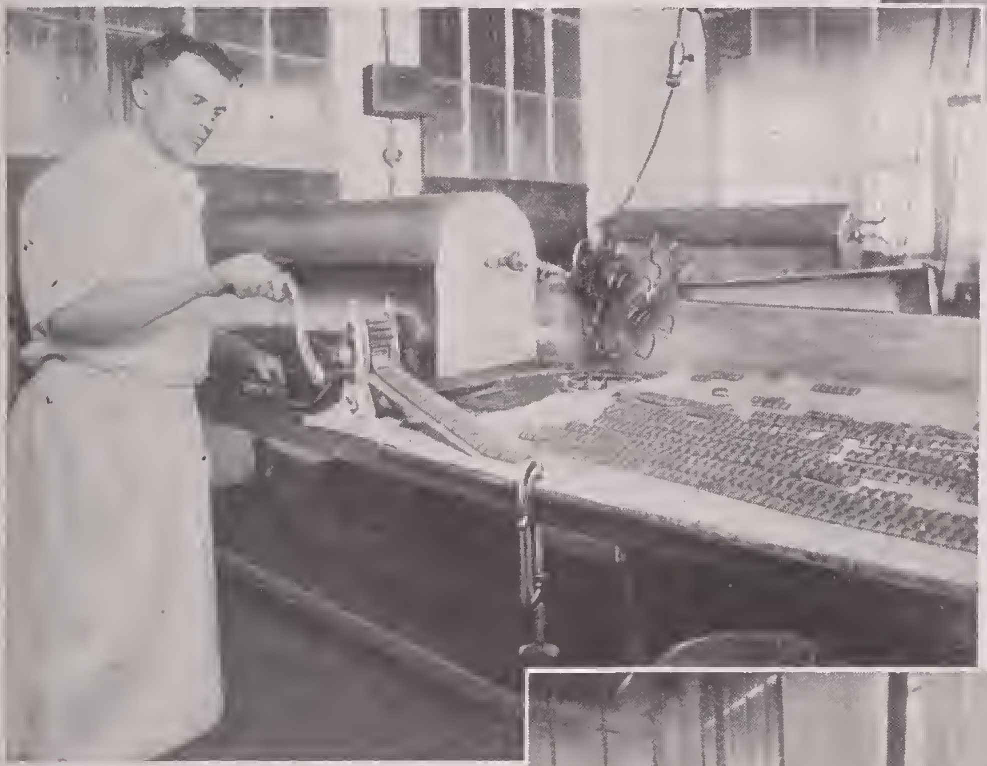
PUTTING THE SYRUP ON TO BOIL



To make the syrup used for hard candies, sugar and water are cooked at a temperature of 340 degrees and then pumped into vacuum machines.

The druggists of those times also used to make candy drops containing peppermint, hoarhound, wintergreen, and other medicinal substances like those still sold in drugstores today. But all these candies were considered as medicines rather than as pleasant things to eat. The child of that time had only honey, jams, cakes, and similar foods to satisfy his sweet tooth. The nearest thing he had to our candy was "sugar candy" which was made at home by dissolving sugar in water and letting it crystallize.

A little more than a hundred years ago, enterprising men conceived the idea of making and selling candies for their own sake, instead of as medicines, and the candy industry was born. At first everything was on a small scale. Old-fashioned stick candy, molasses taffy, and sugar-plums—which are not plums at all, but little plum-shaped bonbons—were the principal products; and the makers retailed their own candies. Later, with the invention of ingenious machinery, the industry grew rapidly, especially in the United States, which is the greatest candy-eating and candy-making nation in the world.



THINK OF WORKING IN A CANDY FACTORY!

Those flat trays shown in the top picture are filled with corn-starch paste which has been printed with hollowed-out patterns by the machine. The same machine then fills these molds with candy cream which hardens into the shapes that are so familiar to us. In the next picture, the workman—lucky man!—is feeding a ribbon of soft candy into a geared machine, which cuts it into those pillow-shaped pieces we know so well. The electric fan is cooling and drying them. That big metal case in the bottom picture is full of almonds and candy paste. As the case revolves the almonds become coated over with smooth layers of candy.

If you ever get a chance to go through a large candy factory, you will be delighted to see what a sunny, airy, shining-clean place it is, with all the workers wearing spotless aprons and caps. Nearly everything is done by wonderful machines. One of the most complicated of these passes a tray under a cascade of finely powdered corn-starch, levels the starch off, makes impressions or molds in the starch, fills the molds with cream, and passes the filled tray on to the drying room. At the same time it takes a pile of starch trays from the drying room, picks out the bottom tray, and turns it upside down on a screen, where the starch is shaken off the hardened candy.

You have noticed, of course, that there are two principal classes of candy, hard and soft. Most of the hard candies are made by boiling sugar, water, and a little glucose, flavoring, and dumping the thick syrup on a slab of marble or steel to cool. The nearly hard candy is then rolled and cut into balls, sticks, slabs, or squares. In making taffy the mass when it has become stiff enough is kneaded and pulled either by one of those pulling machines you have seen in the windows of large candy stores or by workers equipped with hooks. The pulling makes the mass white and porous.

Brittle candies like the familiar peanut brittle are made by merely melting sugar and glucose over a slow fire, adding nuts or other desired ingredients, and allowing the mass to cool.

MAKING HARD CANDIES

After the syrup has been cooked at a temperature of 340 degrees, it is water cooled in this machine, and then cast in the proper shapes.

Soft or cream candies have *fondant* as their base, which is prepared by cooking sugar, glucose, and water to syrup, and kneading the syrup after it has cooled with long paddles until it becomes creamy and smooth. After being molded by the machine described above, the soft centers go to a coating machine, which supplies a coating of chocolate or other material.

This machine, called an "enrober," has a moving belt which carries the centers into the machine. Here they encounter a short belt or wire mesh, through which soft chocolate is being forced from underneath, to coat the bottom of each piece. They then move on automatically to a third belt and are passed under a short section of wire netting above which is suspended a tank of chocolate coating kept warm by a steam-jacket. From the bottom of this tank a thin sheet of the chocolate flows continuously, coating the tops and sides of the creams. The surplus coating flows through the wire mesh into a pan beneath, from which it is automatically pumped again into the suspended tank. The finished chocolates then pass on to another belt, to which are attached at intervals sheets of heavily waxed paper. As each of these is filled it is removed by an attendant and carried on a truck to a cool room to dry. Very fine grades of chocolates are still coated by hand. The process of stamping the manufacturer's name on the bottom of the pieces is accomplished by placing them while warm and soft on tins or heavy papers on which the name is embossed.

Some unscrupulous manufacturers used to use harmful coloring agents, as coal-tar and some containing arsenic, but stringent laws today prohibit such practices, as well as adulteration. Only such harmless coloring materials are now used as saffron for yellow, spinach for green, and beet juice for red. So the consumer now may be satisfied that practically all the candy sold in the United States is pure and free from harmful substances.

American candy-makers have developed an almost endless variety of forms. The simplest kind is the gumdrop made from finely ground sugar mixed with a gum arabic solution or sometimes with gelatin and glucose, molded into the desired shape, and sprinkled with sugar. Marshmallows are made with a mucilage-like liquid obtained from the root of the marshmallow plant. Caramels consist of sugar, glucose, and flavoring matter cooked with cream. Cane molasses is used in making the popular molasses taffy. Fruits, nuts, and flowers are candied by dipping them into a syrup which has been boiled until it is just at the point of crystallizing into sugar. Rock-candy is prepared by allowing a cooked sugar syrup to crystallize around strings stretched through the liquid. Various confectionery products are also imported from Eastern countries, the best known of which is the delectable "Turkish delight." This is a sticky confection made of gum arabic and gelatin, flavored with orange, cinnamon, attar of roses, or the like.

CANKERWORM. A caterpillar that is very destructive to fruit and shade trees, often called the "measuring worm" or "inch worm." The cankerworm moth lays her eggs on the bark of trees. She has to crawl up the trunk to do this, for only the males possess wings. When the eggs hatch the little hungry larvae or cankerworms soon devour all the foliage in their vicinity, often causing the trees to die. When it is time for them to change into moths, they let themselves down to the ground by spinning a long thread of silk, and burrow into the earth for two or three inches, later coming forth as adult moths. Birds are valuable natural checks for these pests, especially the little black-capped chickadees, the red- and white-breasted nuthatches, the brown creeper, the ruby and golden-crowned kinglets, and the downy and hairy woodpeckers. It was with a view to getting rid of the cankerworms that the English sparrows were first imported from England to the United States, in 1851. (*See* Butterflies and Moths.)

CANNA. A generation ago "Indian shot" was a tall rather weedy plant, with very conspicuous leaves and small red flowers which became ragged in a day. It was grown chiefly for foliage, and was known to all boys as furnishing hard black seeds for buckshot.

Then the plant wizards went to work. A Frenchman turned the canna into a brilliant plant, flaunting scarlet and gold blooms of considerable size above green or bronze leaves. This form was crossed with various other species, until the canna is now a rival of the lily and orchid in beauty, but more dependable than either and as self-perpetuating as the potato. The immense flowers, up to six inches across, have colors in every variation of red and yellow—scarlets that dazzle, more delicate shades of pink, rose, salmon, and lemon, and a promise of the pure white that is still being worked for. While some plants top a six-foot man, the dwarf variety—seldom more than four feet in height—is most in favor.

The canna belongs to the *Scitaminaceae* or banana family. It may be propagated either from seed or by dividing the rootstock and planting in pots. The plants are injured by frost and should not be set out until the weather is thoroughly settled. Rich warm soil with plenty of moisture is desirable. Pick the flowers as soon as they wilt to prevent the formation of seeds and the flowers will keep coming all summer. After the stalks have been cut in the fall the roots may be stored and handled like potatoes until wanted for spring planting.

''JERKED'' BEEF—MODERN STYLE

The American Indians in former days used to cut buffalo meat into thin slices and dry it in the sun. This "jerked" meat, as it was called, did not spoil, and it was eaten during the winter months when the buffalo herds had migrated. Today our dried or "chipped" beef is much the same as that old Indian standby. Here we see a group of girls packing it in glass jars.

CANNING INDUSTRY. Today one may enjoy at his own table practically every kind of fruit, vegetable, meat, and fish obtainable for food in any part of the world. This can be done in summer or in winter—in the midst of tropical abundance, on the desert, in the bleak lands of the north, or on the long sea-voyages of sailing vessels.

Aside from the improved means of transportation, the tin can is the most important factor in this wide distribution of foods. Indeed the great variety of canned goods now on the market makes it possible to live almost entirely on "tinned" food. Every expedition of discovery and every army in the field in recent years has used canned foods as an important part of its rations. The traveler's way through the wilderness and across the desert is marked by empty tin cans, and a pile of tin cans grows by the side of each shack on the distant ranch or mining property. The empty tin cans of the country constitute a vast amount of waste. Fortunately the action of rust upon the iron in the tin causes it to break down and crumble before many years, so that the tin and iron are returned to the earth whence they came.

Tin Cans and Canned Goods in the World War

Immense purchases of canned goods were made for the army of the United States in the World War. Over a quarter of a billion cans of tomatoes alone were purchased—enough cans if placed end for end to reach more than around the earth at the Equator. Nearly 40 million cans of evaporated milk and more than 118 million cans of meat were shipped for the army overseas.

In the trenches early in the war the humble tin can rendered a special service to the Allied soldiers. When the hand grenades, which the Germans had manufactured in quantities for the purpose, began to rain upon their trenches, the Allied soldiers took empty jam cans, filled them with explosives and bits of metal, and so made a rough-and-ready grenade which served until supplies of regular grenades could be manufactured and shipped to them.

Our grandmothers did not have these convenient canned foods, for the preserving of foods in hermetically sealed containers is an industry of recent growth. In earlier times the drying of foods was one of the chief methods of preserving it. Meats were dried and smoked, and fruits and vegetables also were dried for winter use. Our grandmothers made quantities of thick jams, jellies, and sugar preserves and pickles of various kinds; but delicious as these were, they were too rich for ordinary food.

Growth of the Canning Industry

In canning, the food is first sterilized by heating—that is, the bacteria which cause fermentation and decay are killed in this manner; and the cans or jars are hermetically sealed to prevent fresh bacteria from entering. The process of canning was introduced in the United States from England and France early in the 19th century, but it did not become a general household practice until after the middle of the century. The first cans were very crude and it required an expert tinsmith to turn out as many as 60 a day. The sheet tin was measured, marked for each can, and cut with a hand shears. Wherever the tin was joined it was thought necessary to pile on a thick ridge of solder, and enough solder to seal a dozen cans as it is done today was used on one can. The cans are now stamped out in quantities by machinery and soldered automatically; and the inside of the can is acid-cleaned and coated with pure tin, so that it can be used for practically all kinds of canning. There was little demand for the canned foods until 1849 when the rush to the gold fields of California began. This was followed by the Civil War and the opening up of the West. These events caused a continuous and increasing demand for canned foods, because they could be transported easily, prepared without delay, and could be stored in quantities for future use without spoiling.

The Cans on the Pantry Shelf

No sooner was a supply of cans available, moreover, than the thrifty housewife back home began to take advantage of the new method, and the coming of winter found rows of canned fruit and vegetables, in addition to preserves and pickles, upon the pantry shelves. Now glass jars sealed with rubber rings are almost universally used in place of the old tin cans which our grandmothers sealed with sealing wax.

One advantage in home canning is the preserving of food that would otherwise be wasted. Great importance was placed upon the conservation of foods in this manner during the World War. Home canning was encouraged, and canning clubs among the boys and girls as well as among the grown-ups added no small amount to the food supply of the country.

BEANS IN THEIR BATH TUBS

Before they are cooked and canned, navy beans are given an extremely thorough washing, as you see. Step by step they pass down this ladder of tubs until they fall into the tank at the bottom—as white as snow.

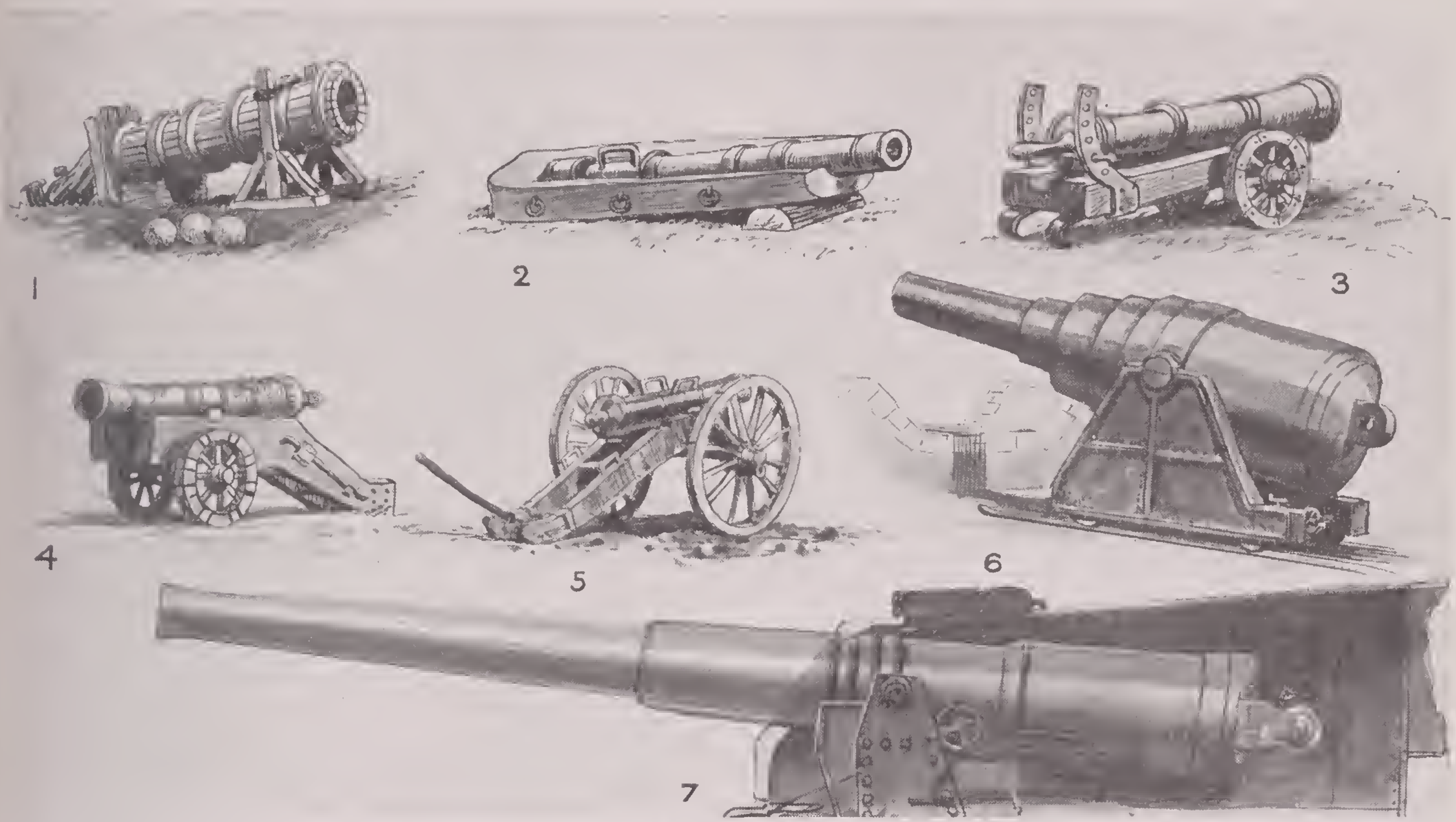
The first canning was done at low temperatures which required a long time for cooking and did not always sterilize the food. Incomplete sterilization caused a large amount of spoilage at first. But when sterilizing is perfect, and sealing properly done, the canned foods will keep for a year or more, and there is no need for the use of chemical preservatives. Shortening the time of cooking by using super-heated water or steam in "closed kettles" or pressure cookers increased the possible output of the factories, and many labor-saving devices in other stages of the canning process have kept pace with the cooking. Peas are shelled and sorted according to size by machinery; corn is taken from the cob and cleaned from the silk by machinery; and the cleaning, peeling, and pitting of fruits also is done by mechanical devices. In the case of soups and other liquids, the cans are dipped and filled by machinery. After the filled cans are heated, an exhaust apparatus takes out the air and the can is sealed by machinery. A machine pastes on the attractive labels, and the cans are automatically packed into boxes ready for shipping.

Great Variety of Canned Foods

There are over a hundred varieties of canned meats on the market besides the great variety of oysters, clams, and fish foods (*see* Salmon). Fruits and vegetables are canned in great variety, also pickles, preserves, jellies, and sauces. Milk with part of the water removed by evaporation, either with or without the addition of sugar, is canned and used for almost all purposes for which whole fresh milk can be used. The condensed milk factories have thus made the production of milk profitable on farms located far from the city markets.

Canning factories for the various products are located in the production areas. In the United States they extend from the sardine factories of Maine to

HOW GUNS GREW UP TO THEIR PRESENT POWER



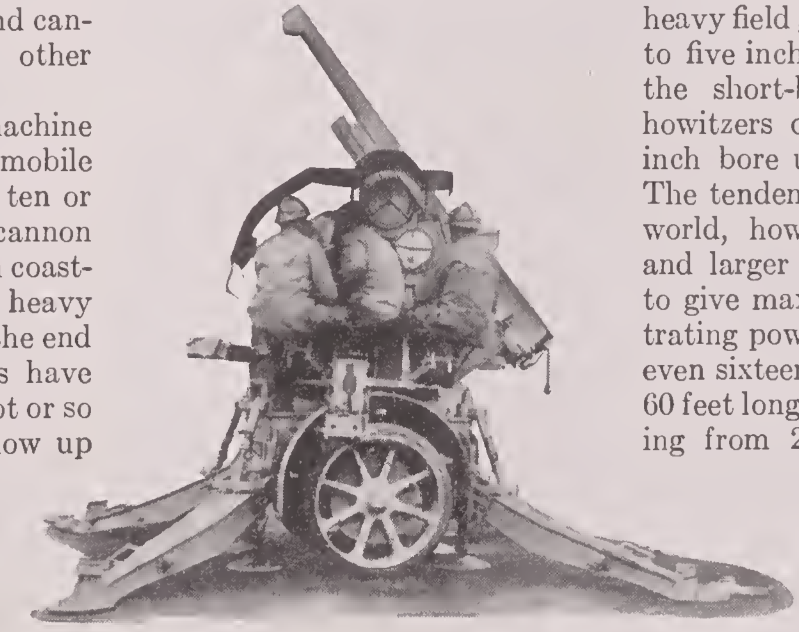
Some of the earliest cannon (1) were made of parallel iron bars arranged like a tube and bound with metal hoops. The first breech-loaders (2) didn't work very well because nearly as much powder gas blew out through the breech as came out through the muzzle. The next gun (3) shows the first attempt to put cannon on wheels and to raise and lower the weapon in sighting. The 16th century guns (4) were fastened to heavy wooden carriages by means of "trunnions," as those pivots on each side are called. Napoleon's field guns (5) were relatively small, but they won many of his greatest battles. The first "built-up" guns (6) were often enormously heavy and of great bore, yet they couldn't shoot nearly as well as the long graceful modern naval guns (7).

the salmon fisheries of Alaska and the Pacific coast, and out to the pineapple canneries of Hawaii. California with her wealth of fruits and vegetables has one-fourth of the canning industry, while the north central states do most of the milk canning, and canning of peas, corn, and other vegetables.

Cannon. Imagine a machine that could pick up an automobile full of people and throw it ten or fifteen miles! The monster cannon on modern battleships and in coast-defense forts hurl shells as heavy as that. What's more, at the end of their journey these shells have enough power to pierce a foot or so of steel armor plate and blow up a ship.

Imagine now a 330-pound steel messenger leaving Independence Hall in Philadelphia, soaring into the air more than four times as high as the highest mountain, and about two minutes later blowing off the top of the Woolworth tower in New York City. This will give you an idea of the performance of the famous "75-mile" gun with which the Germans bombarded Paris during the World War of 1914–18.

THE AIRPLANE'S ENEMY

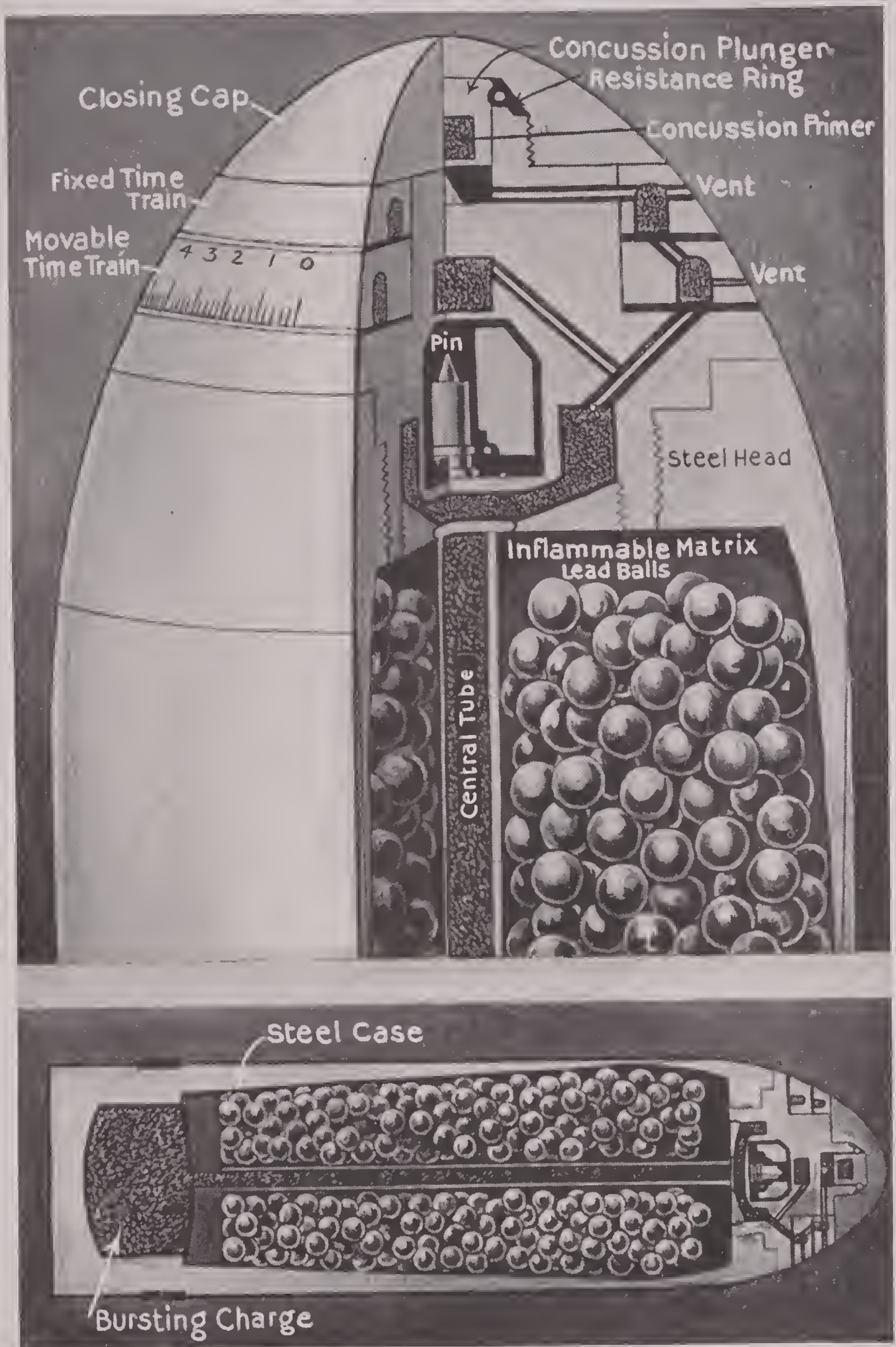


This is one of the types of Anti-Aircraft gun developed during the World War of 1914–18.

More big guns are used on battleships than on land, for their immense weight makes it difficult to move them from place to place with enough speed to be useful. Modern armies are chiefly equipped with light and heavy field guns, ranging from three to five inches in caliber, and with the short-barrelled mortars and howitzers of six-, eight-, and ten-inch bore used in high-angle fire. The tendency in the navies of the world, however, is toward larger and larger guns of extreme length to give maximum range and penetrating power. Fourteen-inch and even sixteen-inch guns from 40 to 60 feet long and firing shells weighing from 2,200 to 2,600 pounds over a range of more than 20 miles form the regular armament of the newer and larger vessels of the United States navy, and of the coast-defense forts. Great Britain carries her naval guns up to 18 inches.

Nevertheless, the largest cannon ever used in battle was a land gun devised by the French during the World War. It had a bore of 20½ inches, a barrel 76 feet long, and fired a shell weighing 3,200 pounds. The destructive effect of this weapon surpassed even the famous "Big Bertha" siege guns with which the Germans shattered the steel and concrete forts of Liége at the beginning of the war. One hit from the French monster in 1918 on Fort Malmaison —the strongest fort ever built—paralyzed the whole garrison and put the fort permanently out of action.

THE SHELL THAT SHOOTS AS IT FLIES



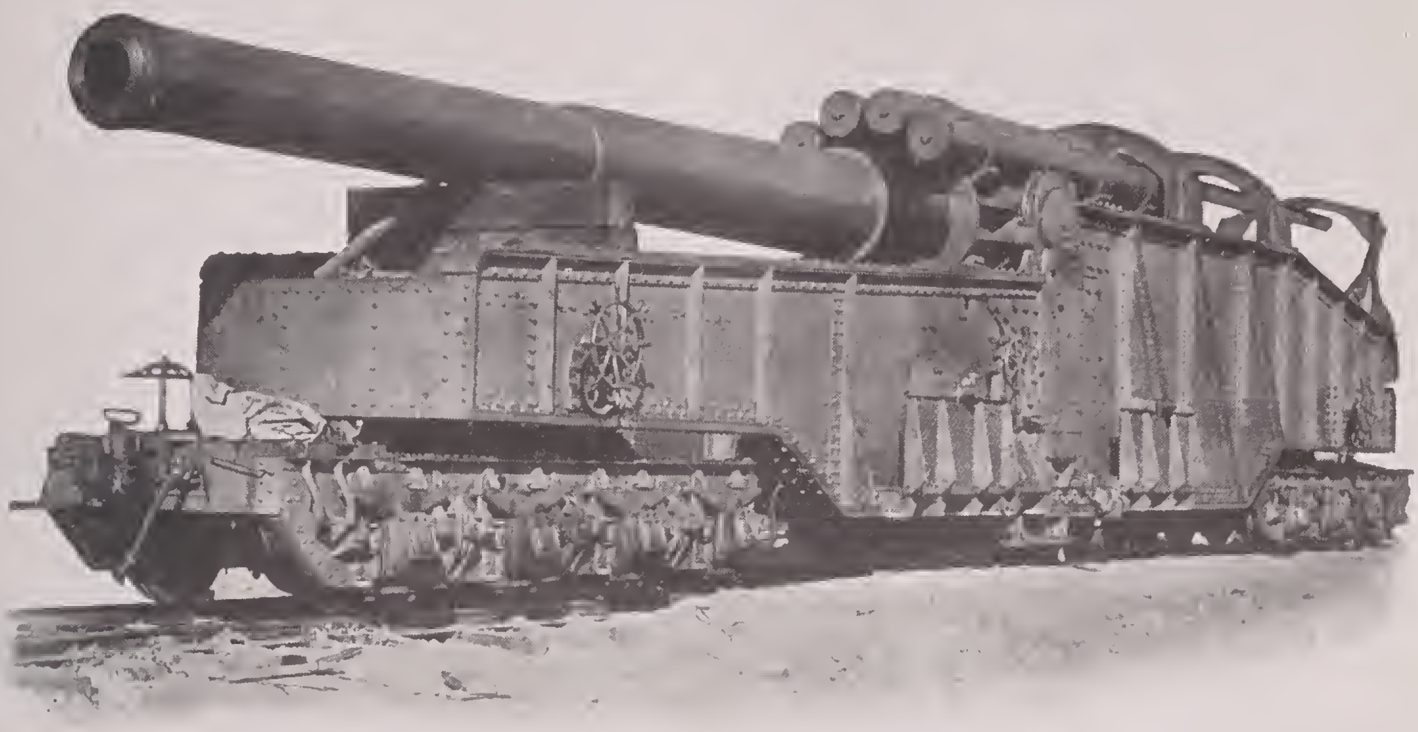
At the top we see the ingenious fuse mechanism contained in the nose of shrapnel. As it is fired from the gun, the concussion plunger at the top strikes against a sharp point below, and sets fire to a train of powder which circles around through those little tunnel vents, and then passes down the central tube to the bursting charge, shown in the lower picture. The length of the powder train in the vents is regulated by turning the graduated scale, and this determines the moment of bursting. The leaden bullets in the steel casing are imbedded in a resinous compound which burns away like a flash, as they are sprayed forward upon the enemy. If the time fuse fails to work, the sharp pin in the middle of the head flies forward, as soon as the shell strikes an obstruction, and sets off the bursting charge.

The "75-mile" gun mentioned before was looked upon as a freak weapon, designed to spread terror rather by its unexpected and startling range than by the destructive effect of its fire. It was only 8¼ inches in caliber, and its 330-pound shell carried only 33 pounds of explosives. However, the velocity of the shell as it left the muzzle of the gun was probably the greatest ever achieved by any man-propelled object—5,000 feet per second. If it could have maintained this rate of speed, which amounts to more than 3,400 miles an hour, it would have encircled the earth in about seven hours.

The shells fired by modern cannon follow in general the same pattern—hollow cylinders of steel with sharp-pointed heads, filled with high explosive which is set off by a percussion fuse as soon as the shell strikes any solid object; around the shell near the base is a brass band to catch in the grooves of the rifling and impart the necessary "spin" to the projectile. Smaller guns use "fixed ammunition," like huge rifle cartridges; but the larger guns load their shell and powder separately: The smaller guns are usually fired by percussion or friction fuses; the larger ones by electricity.

The armor-piercing shell used by the big naval guns is an exception to the standard construction. It has been discovered that a sharp-pointed projectile tends to crumble when it strikes the tough thick metal skin which protects our battleships. For this reason, a broad blunt cap of soft steel is fitted over the hard sharp nose of the shell; and then to reduce the air resistance of this blunt cap, a thin hollow "dummy" point is added. When the projectile strikes the armor plate, the dummy point is smashed and crumbles away, allowing the soft cap to hit the plate. This crashes into the metal and spreads out like a wedge, preparing the way for the hard point, which plows through, drilling a clean hole. The fuse is arranged so the shell will explode after it has reached the interior of the ship.

THE GIANT GUN AND ITS PRIVATE CAR



This is a 14-inch cannon of a type used in the World War. It is so big it has to be mounted on railway trucks. It is shown here in its "sleeping berth," so to speak. When it goes into action, it is raised up on a swinging carriage.

Another projectile of special construction is the shrapnel shell. In its simplest form it contains a light charge of powder in the base, and the remaining space is filled with 250 to 300 small leaden bullets. A time fuse at the point leads back to the powder charge. In this form, the shrapnel is like a small gun itself, fired from a larger gun. At the proper moment during its flight the powder in the base explodes and drives the bullets forward out of the shell-case with increased velocity. The whirling motion of the shell scatters them like water from a garden sprinkler. The time fuse is an ingenious device which can be set so it will explode the shell at any range from 25 feet in front of the gun's muzzle to 5,000 yards or more. This fuse is started by the shock of firing. If it should fail, there is a percussion fuse which will do the work the instant the shell strikes the ground. Shrapnel is the most effective artillery weapon against charging infantry.

Why Big Guns Are "Built Up"

In former days cannon were made of one solid piece of cast or forged metal, but the enormous charges of powder used in modern guns would burst such cannon like paper. A special method of construction called "building up" is used to get the necessary strength and expanding power. A thin inside tube or lining is first bored out and forged by the blows of a powerful steam-hammer. Then a second tube or "sleeve" is prepared, which is slightly too small when cold to fit over the outside of the first tube, but when heated red-hot it expands enough to slide snugly into place. When cooled off again, it grips the inner lining tube like a vise. A second, a third, and even a fourth sleeve may be put on in the same way, each a little shorter than the one before, so that the gun will be thicker at the breech than at the muzzle. Some guns are wound between the sleeves with miles upon miles of strong tough wire.

The most delicate operation in gun-making is cutting the grooves of the rifling, which must be accurate within a thousandth of an inch. The breech mechanism, which has to withstand pressures of 20 to 30 tons per square inch, also requires the most skilful attention. Gun carriages and mountings are no less difficult and expensive to make than the gun itself, for all sorts of delicate mechanism is needed for softening the tremendous "kick" of firing, for swinging the monster weapons over hair-breadth scales when sighting at the target, and for scores of other purposes. The intricate turret mountings of battleships and the wonderful "disappearing" carriages for coast-defense forts are among the devices which make a battery of big guns cost millions of dollars.

Yet, after all this expense and trouble, the active life of a big gun is about *three seconds!* Under the best conditions, it can be fired only 150 to 200 times before it has to go back to the factory for a new lining. If you add up the tiny fractions of time that each one of the shells actually spends in traveling from the breech to the muzzle, you will find the total period during which the gun is employed in actual firing is certainly not more than three seconds. Erosion caused by the tremendous pressure of the explosive gases and the great friction set up by metal against metal at high speed is the cause of this rapid wearing out of the barrel. The shells are also exceedingly expensive, a single charge costing as much as $1,500.

"The Cannon's Opening Roar"

Cannon were first used in European warfare in the 14th century, perhaps at the battle of Crécy between the French and the English in 1346. Beginning as small metal tubes fastened to rude supports, they rapidly grew in size until such huge weapons as the "Dulle Griete," or "great bombard of Ghent," appeared, which was made over 16 feet long, weighing 13 tons, and fired a 25-inch granite ball of 700 pounds.

By the middle of the 16th century, artillery mounted on wheels had come to be an important part of all armies. The earliest big guns were mostly breech-loaders, but no effective means was found of stopping leaks of powder gas, so muzzle-loaders soon took the lead. Stone shot gave way to cast-iron, brass, and lead balls. Bundles of bullets, bolts, fragments of metal, etc., were fired in close-range work against infantry or cavalry. Chain-shot, consisting of two metal balls fastened together with a short length of chain, came into use in naval engagements. They were intended to wrap around and tear down the enemy's masts. Cannister, consisting of a great quantity of small bullets in a metal can which was broken by the force of the explosion, and grape-shot, consisting of a number of larger bullets held together in a frame until they left the muzzle, were among the early projectiles which continued to be used until after the Civil War.

Accuracy of fire, long range, and deep penetration were impossible in the old smooth-bore guns, firing round shot. They depended on the smashing effect of heavy weights coming down from aloft in a high curve, or upon the shattering force of fire at point-blank range, as when ships grappled with each other, their rails almost touching.

What Rifling Did for Marksmanship

A new era in gunnery developed, however, with the discovery and effective use of the principle of rifling, which enabled the guns to fire long missiles without having them turn over and over in the air (*see* Firearms). This change took place in the middle of the 19th century at about the same time that armored ships were first built. Improved methods for setting off the explosive charge contained in the shells and the successful application of the breech-loading system, coupled with the discovery of smokeless powder and the mastery of such high explosives as gun-cotton and nitroglycerin, contributed in turn toward making artillery the powerful and destructive weapon it is today.

Modern gun-fire is an exact science. The naval engagements in the early part of the World War proved that warships must be prepared to fight most of their battles at from five to ten miles' range. Guessing at distances is therefore out of the question, and the gunner of today relies on an intricate system of "fire control," aided by delicate instruments called "range-finders" and the expert calculations of master mathematicians.

Field gunners use a method called "indirect fire" to strike objects beyond their sight over the brow of a hill; anti-aircraft gunners can calculate in a few seconds how fast a tiny speck in the sky is moving, how high up it is, whether it is rising or falling; and they are able to burst their shells around that speck with surprising accuracy.

Each year sees some new addition to the power of cannon. Land forts have already been proved useless before artillery fire, and those mighty sea-fortresses, the modern "dreadnoughts," cannot carry armor so heavy but that a gun will be found to pierce it.

CANTELOPE. A variety of muskmelon with a pale green or yellowish rind and pink flesh. It was first cultivated in Cantalupo, Italy, whence the name. (*See* Melons.)

CAN'TERBURY, ENGLAND. On a spring morning more than 1,300 years ago, when the fair land of Britain had relapsed into heathenism after its conquest by the Angles and Saxons, King Ethelbert of Kent, looking out from his city of Canterbury, saw approaching a procession of Christian monks. They bore before them a silver cross that gleamed in the sunlight and a picture of Christ painted on wood. The holy father Augustine was their leader and they had been sent from Rome by Pope Gregory the Great to carry the message of Christ to the English.

When a young man, so runs the beautiful story, this good pope had seen English boys as slaves in the Roman market. Their blue eyes and golden hair attracted his attention, and he inquired: "Whence come these fair youths?" "From the country of the Angles," he was told. "Truly, they should be called Angels, and not Angles," he replied, "for they have angelic faces." From that day he determined to convert "Angleland," or England as we now call it, to the Christian faith; and now this little band in the year 597 A.D. after the hardships of their long journey were come to carry out this purpose.

Ethelbert's wife, a Frankish princess, was already a Christian, so the king welcomed the monks and gave them refuge within the city of Canterbury. Before long he was won over to the new faith and baptized. His example was followed by 10,000 of his subjects. Augustine was soon made an archbishop by the Pope, and from that time on Canterbury has been the center of English Christianity and the Archbishop of Canterbury has been "primate" of the Church of England.

Beginning of the Great Cathedral

About 500 years after the death of St. Augustine, the ancient Roman church in which he had preached was destroyed by fire. The building of a new cathedral or archbishop's church was begun by Norman architects and builders in the reign of William the Conqueror; but most of the present structure is later. It took four centuries to build, and the story of its growth into its present majestic form is the story of how faith triumphs over misfortune—for it was many times pillaged and damaged by fire, but each time rebuilt, enlarged, and made more beautiful.

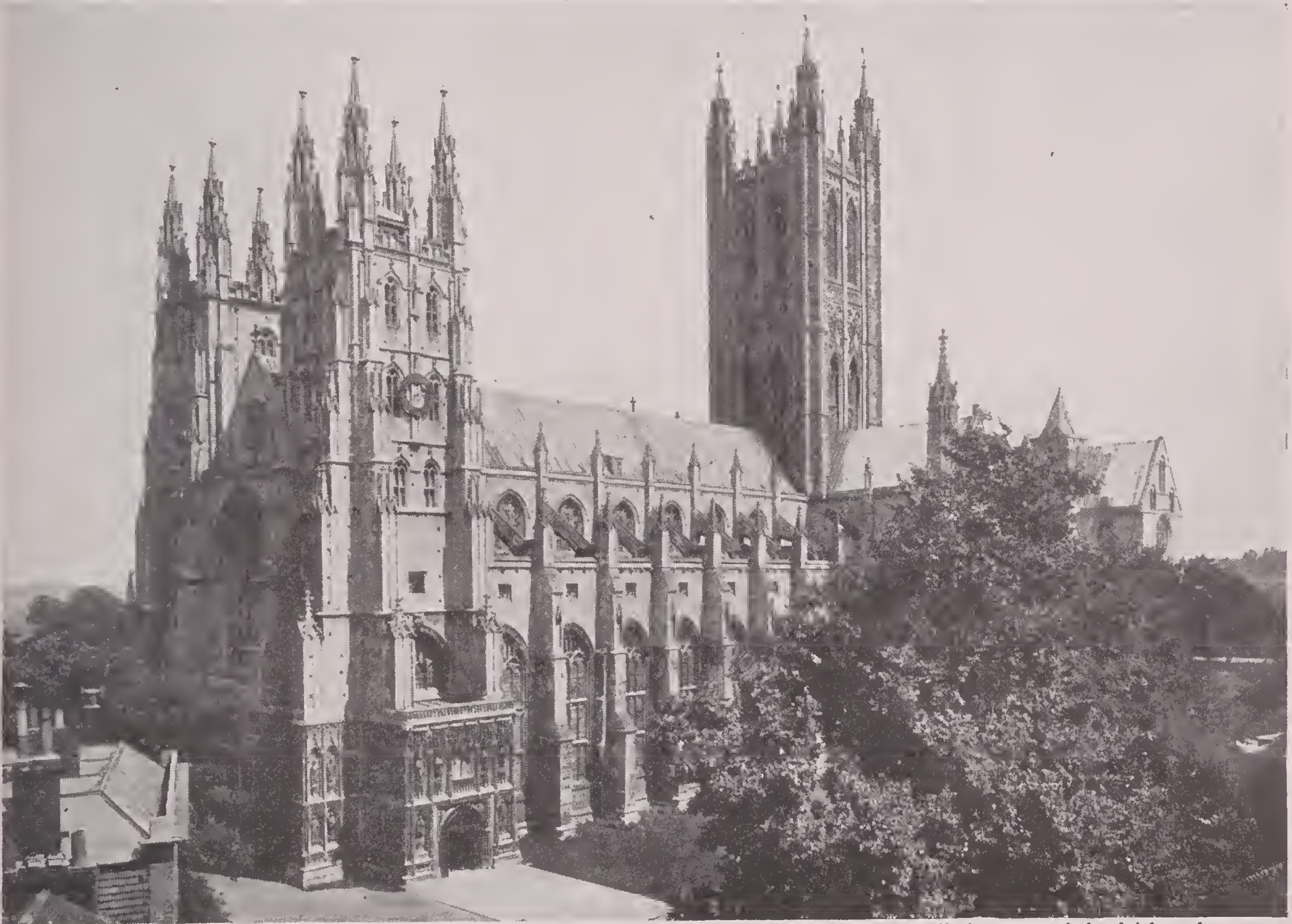
Canterbury cathedral still towers proudly over the old-fashioned town "like a hen brooding over her chickens." Busy little shops nestle close to the stone gateway with its quaint ancient sculptures; but when we pass through this into the wide precincts or "close" of the cathedral, the noise of trade and traffic is shut out, and the peace and quiet of the cloister hold sway. In this "church city" are the palace of the archbishop and the houses of the other clergy who serve in the cathedral—the dean and the canons. Here, too, is the old monastic cloister begun in the 11th century. The chapter-house, or sermon-house as it is now called, and the library have been restored and are now in use. All about these gray stone buildings is velvety lawn, green as only English turf is green, and in the midst towers the giant cathedral—rugged, time-worn, weather-beaten, yet gloriously beautiful still. Flanking the western front are two fine towers; but the eye is carried irresistibly to the center of the structure where high above all rises the cathedral's most striking feature—the Angel Tower or "Bell Harry," with its beautiful proportions and delicate carvings, its lancet windows and soaring pinnacles.

Entering the cathedral we visit the Chapel of the Martyrdom and see the spot where Thomas Becket was slain in the 12th century (*see* Becket, Thomas). For three centuries after, Becket was looked upon as a martyr and a saint, and a constant stream of pilgrims flowed to Canterbury to visit his shrine. This enormously rich shrine is no longer there, but deep grooves in the stone steps show where countless worshipers ascended to it on their knees.

Chaucer in his 'Canterbury Tales' pictures such a band of pilgrims as might have been seen in his day, bent on pleasure as well as religious duty, leisurely enjoying their journey and telling stories along the road (*see* Chaucer, Geoffrey). We can still visit the old inn, known as Chaucer's Inn, where such a company may have been housed; and can also see the old city gate, part of a wall that surrounded the town in those medieval days, through which they may have passed.

New life, however, has entered the old city. Along the hurrying River Stour are mills, tanneries, and breweries, and a thriving trade is carried on in grain and hops. But the new has not driven out the old. The medieval houses with their overhanging gables, the Guildhall dating back to the 15th century, and St. Martin's Church dating from Roman days and said to be the oldest church in England, all point to the days that are no more. Population, about 25,000.

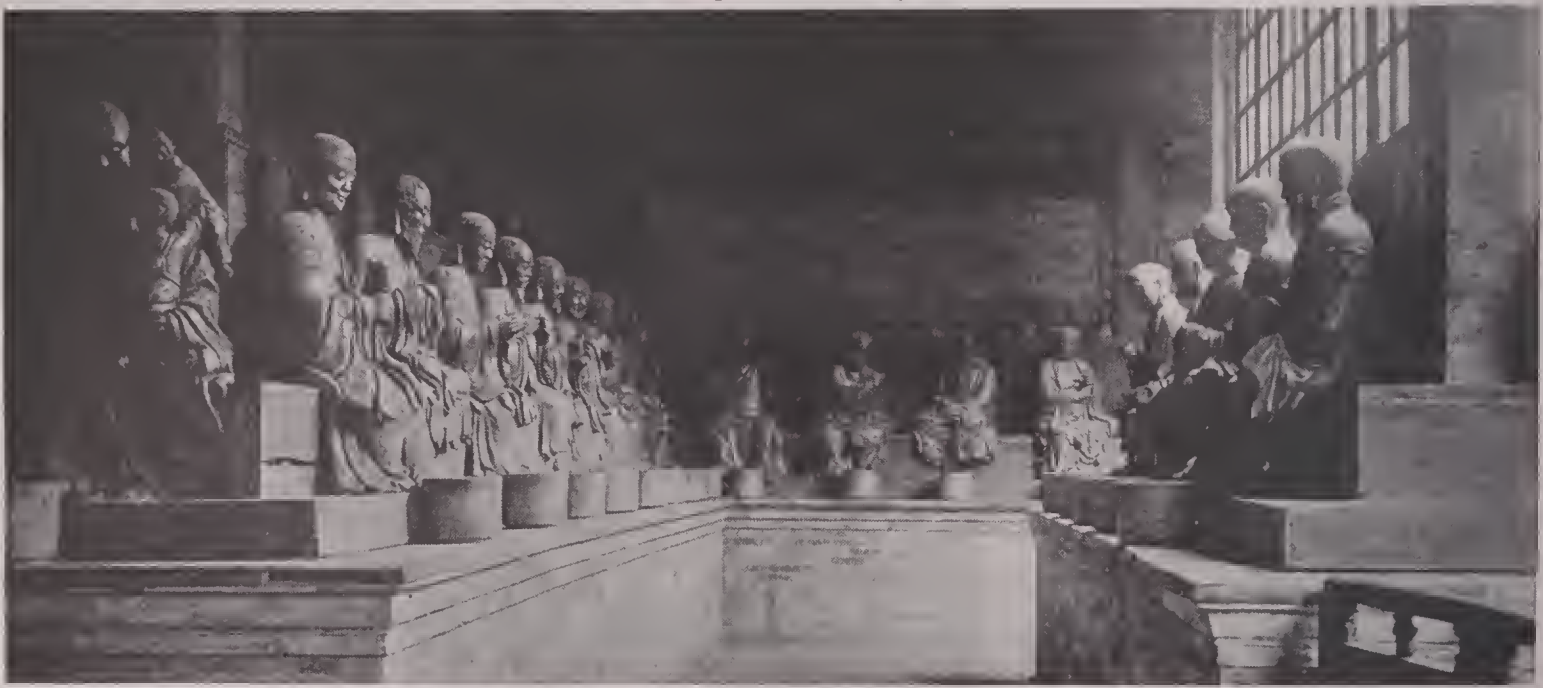
CANTERBURY CATHEDRAL, GLORIOUS MONUMENT OF FAITH



Here is the noble mother church of England which, in its beautiful walls and Gothic towers, tells in stone of the faith and courage of its builders and the religious history of England for nearly a thousand years. It was built chiefly in the 14th and 15th centuries and is in the "perpendicular" style of Gothic.

Canterbury was already of considerable importance in 55 B.C., when Julius Caesar invaded Britain. When the city was occupied by the Romans it was given the name *Durovernum*. Later, as the center of the early English kingdom of Kent, it became known as *Cantwaraburh*, or "Kentishmen's town," from which comes its present name.

THE GREAT GOD BUDDHA IN MANY MOODS

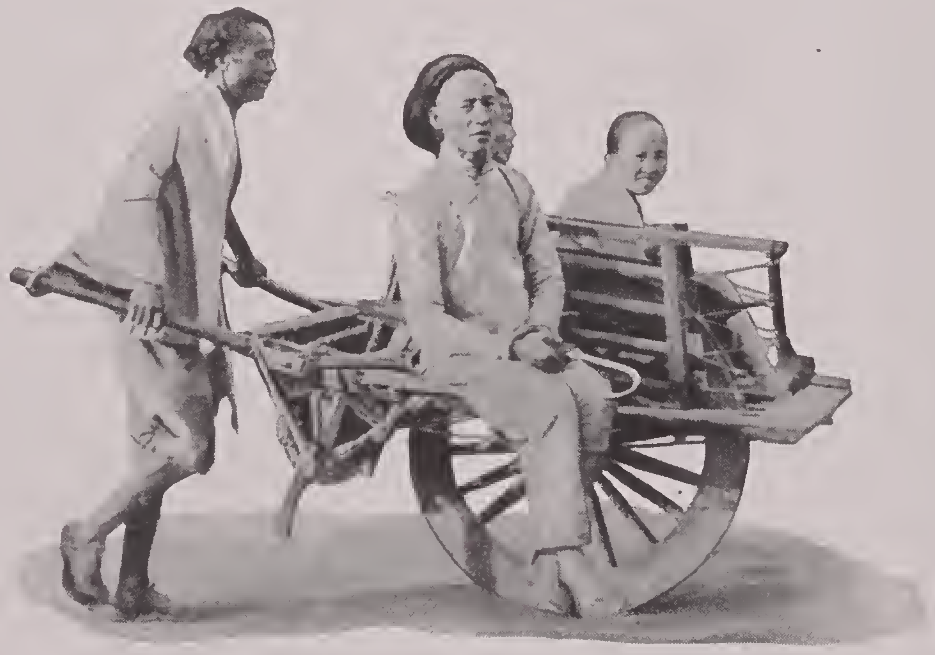


These statues in a temple at Canton are all of the god Buddha, but represent different aspects of his power. If the worshiper wants to be cured of disease, for example, he bows before one statue; if he wants rain, he bows before another.

CANTIGNY (*căn-tē-nyē'*), FRANCE. At 6:45 in the morning of May 28, 1918, the Americans started their first offensive in the World War. The place was the village of Cantigny, 18 miles south of Amiens, which marked the extreme western advance of the Germans in their desperate drive. Within a few hours the village was in the hands of American troops. As General Pershing said, the battle "demonstrated our fighting qualities under extreme battle conditions." It was the first of that series of exploits which brought the United States flag opposite Sedan five and a half months later, in the face of a foe clamoring for peace. (*See* Château-Thierry.)

CANTON, CHINA. The Chinese call Canton the "City of Rams" from a fable regarding its origin. This relates that a century or so before Christ travelers from the basin of the Yellow River, journeying southward, decided to settle there. Then from the north came five fairy men riding on the backs of goats, each of them bearing a stalk of grain and bidding the people live in peace. The fairies disappeared, but the goats turned to stone, and may still be seen in the Temple of the Five Rams.

A CHINESE TAXI—FARE ONE CENT



You can ride from one end of Canton to the other on one of these "taxi-barrows." Passengers are so distributed as to balance each other.

Canton is the capital of Kwangtung province and the commercial center of southern China. It is situated at the apex of the delta of the Shu-kiang or Pearl River. The entire city is encircled by brick walls, 25 to 40 feet in height, and 20 feet thick. An inner wall divides the enclosure into two unequal parts; the northern and larger division is the old city, the smaller is the new. The foreign quarter, where reside the British and French inhabitants, is separated from the native parts by a 60-foot canal. Here the broad streets bordered with spreading tamarind trees are in striking contrast to the crowded and dirty ways of the Chinese city, which are too narrow and winding for the passing of "rickshaws"—the common two-wheeled vehicles drawn by men. The ordinary mode of conveyance, therefore, is in a sedan chair borne on the shoulders of stout coolies. A stranger in Canton notes with interest the hollows in the large square paving stones, worn by the tread of millions of bare feet.

There are 600 of these narrow crooked streets and rows upon rows of flat reddish roofs, the monotony of which is relieved by two pagodas, the Gothic spires of the French cathedral, and the pawn shop towers.

"Why these high towers?" you ask your guide. "So that the pawnbrokers can easily throw down stones upon the heads of approaching robbers," is the answer.

Homes and shops form solid walls along the roadways. Even the river is a great street of floating homes. For miles along the waterside are massed thousands of boats, in which live several thousand citizens of old Canton. Many of them are born, live, and die without ever having a home on land. The river dwellers form a complete community, with their own tradespeople, priests, teachers, and workmen. The number living in these houseboats and along the swarming streets is vaguely estimated at a million and a quarter persons.

One of the most interesting structures is the hall in which the official examinations were held which admitted the successful contestants to appointments under the government. The building accommodated at one time nearly 9,000 persons in individual stalls. Success in these examinations depended on the memorizing of the Chinese literary and philosophical classics, but in 1905 this system was abolished and the great hall is now deserted.

As for temples, the city has more than 500, the most famous being the Buddhist temple on Honan, the island suburb. This institution covers seven acres divided into courts, and requires the services of 175 priests. Others of great fame are the Temple of Five Hundred Gods, so called from the numerous statues of Buddha and his followers, and the Temple of Longevity. In the tower of another old temple stands the ancient water clock, which for 20 centuries has indicated the hours, with its simple arrangement of copper buckets and tiny troughs. Though now and then one or another temple is restored in full splendor, most of them bear marks of neglect.

"Everything new originates in Canton," is a Chinese proverb. It was the first Chinese city to be opened up to trade. Arab traders journeyed thither by caravan as early as the 9th century. The Portuguese opened trade relations in 1517, and were soon followed by the Dutch, and a little more than a century later by the English. In the closing decades of the 18th century the speedy clipper ships of New York, Boston, and old Salem began making their hazardous trips to Canton by way of Cape Horn.

Stirred by this contact with foreign life and thought, the Cantonese have always been the most progressive and adventurous of their countrymen. Most of the Chinese emigrants to Hawaii, the Philippines, and America have come from Canton, so that the Cantonese has come to stand abroad as the typical Chinese. Returning to their birthplace after saving up modest fortunes abroad, these adventurous spirits have brought back ideas strange to their conservative fellow-citizens, thus making Canton the seat of political as well as commercial progressiveness. It was in the streets of Canton that were heard the first whisperings which resulted in the revolution of 1911, and Canton has also been the center of later revolutionary movements.

CANUTE (*kȧ-nūt'*) (994–1035). This great king of the Danes and Norwegians, who in addition ruled England from 1017 to 1035, was much more than a conquering viking. Since the days of Alfred, over a century before, the Northmen had never ceased to cherish their dreams of overcoming England. Canute's father Sweyn, king of Denmark, died in the midst of his attempted conquest of that land, and Canute (or Cnut) immediately resumed the struggle. For a brief time there was a division of the country between Canute and the Saxon Edmund Ironside, but the death of Edmund, in 1017, gave the whole kingdom to the young Danish conqueror. Canute put to death some of the more powerful English nobles, but from this time onward until his death, in 1035, his character seems to have completely changed. At once he laid aside his ruthless temper, to become a wise ruler and a devout Christian. He made a pilgrimage to Rome, and wrote back a letter to his subjects which shows the noble simplicity of his character and the high idea he had formed of the duty of a king. The death of his elder brother brought him the throne of Denmark, and that of Norway soon followed. Canute gave England 18 years of peace and order, but at his death his kingdom fell to pieces, as it had depended upon his own personal greatness.

A story is told of how this monarch rebuked the flattery of his courtiers, who had said that all things were possible to him. He had his throne placed on the seashore and when the rising tide came near, he ordered the sea to fall back at his command. When the water wetted his feet, he turned to his courtiers and said: "Let all men know how empty and worthless is the power of kings; for there is none worthy of the name but Him whom heaven, earth, and sea obey."

CANYON. In the western part of the United States many rivers have cut deep channels with precipitous sides. Such a gorge is called a canyon, from the Spanish word meaning "tube." Canyons usually occur in the upper course of rivers where the current is swift, and in dry regions where there is not enough rainfall to widen the channel into a broad valley with sloping sides. Some of the most notable examples are the canyons of the Rio Grande, Yellowstone, and Colorado rivers. (*See* Grand Canyon.)

CAPE BRETON ISLAND, CANADA. "One can search the world in vain," says an enthusiastic visitor, "for lovelier or happier scenes than meet one everywhere throughout romantic Cape Breton." The thousands of tourists from the United States and from other parts of Canada who visit this favored island every summer will testify that this statement, by one of America's geographical authorities, is not too highly colored. The deeply indented coasts, graceful wooded hills, rich upland pastures, and beautiful lakes and rivers make Cape Breton Island a paradise for summer visitors; and its attractions for the tourist are enhanced by the fact that its population is predominantly Highland Scottish—descendants of settlers who came in the closing years of the 18th century and early years of the 19th.

Cape Breton Island forms the northeastern part of Nova Scotia, from which it is separated by the narrow Strait of Canso. Its most striking feature is the Bras d'Or lakes, an almost land-locked arm of the Atlantic which extends through the heart of the island with nearly a thousand miles of interior coastline, forming one of the finest yachting courses in the world.

Commercially, Cape Breton is of increasing importance because of its great deposits of coal, iron, and limestone, and its growing steel industry. The coal field in the region of Sydney, the chief town, is one of the most valuable in all Canada. The land area of this field is only the end of a great deposit extending far out under the Atlantic, which is already being worked two miles from shore. The harbor of Sydney, one of the best on the Atlantic, enjoys the great advantage of being nearer to European markets than any other North Atlantic port. Wood pulp manufacture, agriculture, and fishing are also important industries.

The fortress of Louisburg, now a heap of ruins, was once the naval base of French power in America. Area of the island, about 3,120 square miles; greatest length, 110 miles; greatest width, 87 miles. Population, about 100,000.

CAPE COD. The L-shaped peninsula known as Cape Cod is one of the most peculiar physical formations on the New England coast. It might be compared to a human arm with the forearm bent and the hand half clenched. The peninsula is low and sandy, and forms one of the counties of Massachusetts. It extends between Nantucket Sound on the south and Cape Cod Bay on the north, the total length being about 65 miles. It varies in width from one to ten miles. There is little vegetation, though there are numerous cranberry bogs, and forests of pine and oak flourish at the head of the cape. Its many harbors are the haven of seamen who live in numerous thriving villages. The peninsula is also a favorite place of summer residence for the people of Massachusetts and New England. Bartholomew Gosnold, who discovered Cape Cod, May 15, 1602, is supposed to have given it its name from the quantity of codfish taken off its shores. On Nov. 9, 1620, the *Mayflower* arrived at its coast and the next day cast anchor in what is now the harbor of Provincetown.

The Cape Cod Canal, cut across the neck of the peninsula to join Cape Cod Bay with Buzzards Bay, saves 70 miles in the voyage between Boston and New York, and permits vessels to avoid the shoals of Nantucket. The canal was suggested in colonial days, but it was not till 1914 that it was actually opened. The canal proper is eight miles long and has a depth of 25 feet at low water. It cost $12,000,000, but is estimated to save at least $500,000 annually by preventing the wrecks that were caused by the shoals and storms of the outer route.

CAPE OF GOOD HOPE. When Bartholomew Diaz, the Portuguese explorer, returned from his wonderful voyage in 1488, on which he reached the supposed southern point of the African continent and solved the question of an ocean route to India, he presented to the king of Portugal a map on which this cape was named "the Cape of Storms" (*Cabo Tormentoso*), because of the terrible gales which he had encountered there. "Let us rather call it the Cape of Good Hope" (*Cabo da Boa Esperanca*), said the king; and so it is known to this day. Ten years after Diaz made his venturesome voyage, Vasco da Gama, following in his track, rounded the continent and reached India. Thenceforth the Atlantic instead of the Mediterranean became the chief highway of the world's commerce; and the Cape of Good Hope acquired great importance as the half-way point in the sea route to India and the East.

The scenery is bold and picturesque. At the northern end of the cape peninsula is the flat-topped Table Mountain whose northern slopes form Table Bay, the harbor of Cape Town. Rounding the storm-vexed Cape of Good Hope, the shore trends southeastward in a series of curves, forming shallow bays, until at the saw-edged reefs of Cape Agulhas, 130 miles to the east, the real southernmost point of the African continent is reached.

CAPE TOWN, SOUTH AFRICA. Few cities are more beautifully situated than Cape Town, the capital of the province of the Cape of Good Hope and the seat of government of the South African Union. It lies along the shore of Table Bay, about 30 miles north of the Cape of Good Hope, and is inclosed on the land sides within a massive wall of towering mountains. Behind the bay rises Table Mountain, over 3,500 feet high and two miles in length, and to the east and west are Devils Peak (3,300 feet high) and Lions Head (over 2,000 feet), overhanging the plain in which the city lies.

Cape Town was founded in 1652 by colonists of the Dutch East India Company under Johann Van Riebeck. In 1806 it was captured by the British during the Napoleonic wars and it has remained a British possession. Until the middle of the 19th century the town looked like a bit of old Holland set down in Africa. Now nearly all the stucco-fronted brick houses, built by the early settlers, with their flat roofs and cornices and wide-spreading *stoeps* or verandas, have been replaced by modern English shops, offices, and warehouses. Many fine public buildings have been erected since 1860, including the government buildings, two cathedrals, and the buildings which house Cape University and South African College.

Nearly half the people are colored, of varied racial mixtures. The numerous East Indians in their gorgeous raiment give color to the street scenes, and their Mohammedan mosques and houses built in Asiatic style contrast curiously with the modern buildings and the antiquated fortress at the head of the bay. A chain of beautiful suburbs—some of them popular seaside resorts—stretch west and east of the city. The mean temperature for January is 68° Fahrenheit and for July, 54°. A southeast wind which blows in the summer (January) is called the "Cape Doctor" on account of its bracing qualities.

Cape Town carries on an important commerce with Europe; through it passes the greater part of the colony's exports of diamonds and bar gold. The port has been provided with an extensive breakwater as a protection from the northwest gales. It has a white population of about 100,000, with approximately an equal number of colored persons.

CAPE VERDE (*vĕrd*) **ISLANDS.** These islands, forming a Portuguese colony, lie in the Atlantic Ocean off the coast of Africa, 320 miles west of Cape Verde, from which they are named. The group consists of ten islands and several rocky islets, the total area being 1,480 square miles. They are all of volcanic origin, and one of them, Fogo, is a volcano about 10,000 feet high, which is still active at times.

The climate is hot and unhealthful; and droughts have often occurred, causing famine and great loss of life. Sugar, coffee, rice, tobacco, and millet are produced, as well as bananas, lemons, oranges, citrons, grapes, and nuts. Goats, horses, and asses thrive.

The inhabitants are chiefly colored, less than one-twentieth being white. The people are lazy, and slavery, which existed until 1876, has left its mark on them. The religion is Roman Catholicism, though the old pagan beliefs have not yet entirely died out.

Praia, situated on São Thiago (Santiago), the largest and most populous of the islands, is the capital of the group, and residence of the governor-general. Porto Grande, on the island of São Vicente (St. Vincent), is a coaling-station for steamers and the commercial center of the islands. Most of the business at this port is in English hands.

The Cape Verde Islands were discovered in 1441 by the Portuguese, who have held them ever since. Total population of the group, about 150,000.

CAPILLARY ATTRACTION. If you drop the corner of a towel in the bathtub, what happens? The water climbs up the threads and soon the whole towel is wet. If you take a lump of sugar and dip one end of it in cocoa, in a few seconds the whole lump is soaked. Blotting paper takes up ink, and lampwicks raise oil to the burner in the same way.

Men first studied the action of this force in tiny tubes little larger than a hair, and so they called it "capillary attraction" or "capillarity," from the Latin word *capillus* meaning "hair." They found that when one end of a very small tube is put in a glass of water, the water will rise just a little higher in the tube than its level in the glass. And the finer the tube the greater the height to which the water will be drawn upwards.

Sugar, salt, starch, sponges and the fibers of plants all have a multitude of tiny tubes and hollows that pull up—or, as we say, "soak up"— water or other fluids just as the glass tube does.

This principle of capillarity is very important in farming, for on it depends the power that water has to rise above the water level in the soil toward the surface. Here it is the soil particles that pull the water up, just as a lampwick or the towel does; and just as the water rises highest when the tube is smallest, so the smaller the particles of dirt are, and the closer they are together, the more freely the moisture rises. When we plant small seeds we press the earth firmly down about them, so that the moisture will rise more readily and help the seeds to sprout. Sometimes after a summer shower the upper layer of earth is packed in a hard crust. Then the moisture is quickly drawn through this tightly packed earth to be evaporated by the air, and thus lost to the soil and the plant roots.

Let us take another lump of sugar and, before dipping it into the cocoa, sprinkle a little granulated sugar over the top. The cocoa rises quickly up to this layer of loose sugar, but it takes considerable time to pass through that. In those regions where there is a great deal of rainfall in the early spring, but very little through the hot summer months, the farmers take advantage of this principle in what is known as "dry farming." First, the soil is plowed deep and fine, and packed down pretty firmly so the moisture can come up readily around the roots of the plant. But on the surface the soil is stirred and worked to make a layer of dry pulverized earth, called a "mulch." This checks the moisture, so it will not evaporate into the air, just as the dry sugar checked the cocoa. By harrowing it is renewed as often as is necessary.

CARBOLIC ACID. Before the World War of 1914–18, carbolic acid (which is also known as phenol) was chiefly valuable for its uses in medicine, in the dye-making industry, and in making phonograph records. Nearly all of the American supply was imported from England. But during the war the military importance of carbolic acid in the making of picric acid, which is the most important source of high explosives, overshadowed all its other uses. So great was the demand that, when the imports were cut off, prices soared 2,000 per cent, and the United States for the first time developed a phenol industry.

Carbolic acid is one of the products resulting from the distillation of coal-tar, which is obtained chiefly from gas works. Until 1914 three-fourths of the coal from which gas was made was coked in ovens which wasted all the by-products. During the war all the large cities installed machinery for recovering these by-products, and many plants were erected for the artificial or synthetic production of carbolic acid (*see* Coal-Tar Products).

The crude product is a dark-colored oil; when purified it forms large colorless crystals. Pure phenol has a very corrosive action on the skin, producing white burns which are difficult to heal. A three per cent solution is used for washing wounds and disinfecting the hands, as that strength is sufficient to kill bacteria. Taken internally it is a strong poison.

CARBON. The soft black "lead" in our pencils—which is not lead at all but graphite—and the hard diamond, flashing and brilliant, are both pure carbon. The gritty charred mass left after wood is burned, which we call charcoal, and the hard black coal we burn in our furnaces are mostly carbon. Indeed, the more carbon there is in coal the better it is; if it is more than 90 per cent carbon we call it "hard" coal or "anthracite." Sugar is about 40 per cent carbon, and when a lump of it is heated the charred mass that remains behind is chiefly carbon. The soot produced when organic matter is burned is almost all carbon.

At ordinary temperatures carbon is an inactive element; graphite or a diamond will lie under water for ages and remain unchanged. Carbon cannot be melted. A thread of carbon inclosed in a glass bulb from which the air has been sucked out, when raised to a very high temperature by an electric current, glows with an extremely bright light, but it neither burns nor melts. This is the principle of the incandescent light. It dissolves to a certain extent in molten iron, and if it is then suddenly cooled under great pressure it sometimes crystallizes into minute diamonds.

Carbon enters into an almost unending number of compounds, and its chemical history is so long and so varied that all chemistry is divided into two great branches, the second of which (called "organic chemistry") is devoted exclusively to carbon compounds. More than 200,000 carbon compounds are known and thousands are being added every year.

Carbon gives us all our fuel. In coal, kerosene, gas, oil, fat, lard, tallow, suet, blubber, wood, or any form of fuel whatever, carbon is one of the elements which, uniting with the oxygen, gives us heat and light. Carbon gives us our food and clothing, for carbon is the basis upon which all animal and vegetable tissues are built up. Green grass, hay, honey, and starch all contain carbon. It is present in tea, coffee, bread, vinegar, butter, and almost every other article of food, and cotton and wool are largely made up of this important element.

United with oxygen it forms the gas carbon dioxide. With hydrogen it forms marsh gas and a great number of hydrocarbons, as those of petroleum and numerous coal-tar products. With hydrogen and oxygen it forms acetic acid and other organic acids, alcohols, oils and fats, and the carbohydrates, of which the sugars, starches, and cellulose, important constituents of plants, are the best known.

A great many very complicated compounds occur in plants, and particularly in animals, in which (besides carbon, hydrogen, and oxygen) nitrogen and sometimes sulphur and other elements are present. Carbon also unites with certain metals, and with iron it forms steel and cast-iron. Certain denser forms of carbon, such as retort carbon from gas works and petroleum refining, conduct electricity well and are extensively used in batteries and electric lamps. Calcium carbide is a compound of calcium and carbon used in generating acetylene gas. (*See* Charcoal; Coal; Diamond; Graphite.)

CARBON DIOXIDE AND MONOXIDE. Every animal that lives is constantly breathing forth carbon dioxide (often called "carbonic acid gas"), and every fire where carbon compounds are burned gives off this colorless, tasteless gas. Plants with green foliage, on the contrary, take up carbon dioxide from the air during the daytime, consume the carbon in it, and give back the oxygen to the air (*see* Leaves).

Carbon dioxide contains one atom of carbon to two atoms of oxygen, hence its chemical symbol is CO_2. It forms about $\frac{1}{2500}$ of the earth's atmosphere. Carbon dioxide is heavier than air, and can be carried in a vessel and poured like water. Unlike oxygen, it does not support combustion, but will put out a fire. Some chemical fire extinguishers, therefore, are constructed so as to give off carbon dioxide. If the pure gas is breathed, or air containing considerable quantities of it, it will cause death through suffocation, because the lungs do not get the necessary oxygen. Under the name of "choke damp" it is one of the perils most dreaded by the miner.

Under pressure of 600 pounds to the square inch carbon dioxide is liquefied. When this liquid escapes through a small jet it evaporates rapidly and the cold produced by the evaporation causes part of the liquid to freeze and look like snow. Carbon dioxide dissolves in water, forming carbonic acid. When pressure has been used to make a greater amount dissolve than is ordinarily taken up, "charged" or carbonated water—soda water, seltzer water, etc.—is produced. Hence carbon dioxide is frequently transported in cylinders in a liquid form for use in soda fountains.

Carbon monoxide is an even more dangerous gas. It differs from carbon dioxide in containing only one atom of oxygen to one of carbon; its chemical symbol therefore is CO. It is this highly poisonous gas which causes death when a person remains too long in a tightly closed bathroom with a gas heater in operation, or in a closed garage with the automobile engine running. It is because of its presence in ordinary illuminating gas that it is dangerous to inhale even small quantities of the latter. Carbon monoxide escaping from coal stoves or furnaces sometimes asphyxiates whole families.

Mr. Cardinal has stepped into a feeding station during a shower.

CARDINAL BIRD. *"What cheer? What cheer?"* the red-bird calls. And you always answer, *"Good cheer!"* For just one sight of him—red from bill-tip to tail-tip, with his handsome jet crown—makes one feel glad.

The cardinal is a bird-masterpiece. Only $8\frac{3}{4}$ inches long, his form is perfect and his plumage proves how many shades of red can be blended into one flash of flame. His call is not excelled in bird language and his song is as happy as its singer. He is friendly, but not bold; proud, but not haughty; gay, but not pert. He eats nothing he shouldn't and much that he should. He is an ardent lover and a tender father.

His mate, who also wears a crown and sings a lovely song—contrary to custom among the females of birdland—has feathers of soft brown-gray flushed with red. The birds nest low in evergreen trees; the eggs, two to four, are pale gray shaded with purple and brown. When the first brood leaves the nest the father bird cares for them while the mother bird hatches a second brood. The food is wild fruits, weed seeds, and insects, especially grasshoppers, beetles, and larvae.

Cardinals are plentiful throughout the southern states and are common as far north as Iowa and New York, but are not found on the plains. They often winter in their northern homes. In former times they were trapped or taken from the nest for cage birds, but today it is forbidden by federal law to ship them from one state to another.

Cardinals belong to the grosbeak group of the finch family. Scientific name, *Cardinalis cardinalis*.

CARDINALS, College of. The importance in the Roman Catholic church of these advisers of the Pope is shown by their very name "Cardinals," which means "superior" or "excellent" (from the Latin *cardo*, a "hinge"). The Pope usually seeks their advice on all important questions of church government. Since the year 1059 they have formed a body known as the College of Cardinals, which at the death of a pope is given the important function of choosing the new head of the church. From time to time the Pope presides at a formal meeting of the cardinals, called a "consistory," in which the general affairs of the church are the subject of solemn discussion, and at which important announcements of policies may be made. A greater part of the church administration also is conducted by commissions of cardinals, called "congregations" (*see* Papacy). Though the cardinals rank next below the Pope in importance in the government of the church, this office confers on them no place in the ecclesiastical hierarchy of priest, bishop, etc.

Originally the cardinals consisted of the chief priests of the churches in Rome, together with a certain number of deacons, and the bishops of the seven neighboring dioceses. Even today they are distinguished as "cardinal bishops," "cardinal priests," and "cardinal deacons," according to the offices which are assigned to them in the churches about Rome. Not merely Italians are now appointed, but also Roman Catholic clergy from other lands. For example, there are usually three American cardinals, and most other important countries are represented. The cardinals are all appointed by the Pope and hold office for life. Since 1586 their number has been limited to 70, though usually there are a number of vacancies. All of the cardinal bishops (7) and most of the cardinal deacons (14) live in Rome, but most of the cardinal priests are residents of other countries.

From their bright scarlet hat with its 15 tassels on each side, the official emblem of the cardinal, and from their red robes, we get the name *cardinal* for a certain shade of red.

Because of its showy scarlet blossoms we also call one variety of lobelia (*Lobelia cardinalis*) the cardinal flower. From the same Latin word the ancients gave the name "cardinal virtue" to justice, prudence, temperance, and fortitude, for on those all other virtues "hinge." In the same way the numbers 1, 2, 3, etc., are called "cardinal numbers," as opposed to the "ordinals," first, second, third, etc. And north, south, east, and west are often styled the "cardinal" points of the compass.

CARDS, Playing. Cards for playing games of chance are of the most remote antiquity and are used in almost every country, and the games played are as various as the size of the packs and the designs on the pasteboards. In his 'Rape of the Lock' Pope charmingly describes those most common in Anglo-Saxon countries:

> Behold four kings in majesty revered,
> With hoary whiskers and a forky beard;
> And four fair queens whose hands sustain a flower,
> The expressive emblem of their softer power;
> Four knaves in garbs succinct, a trusty band,
> Caps on their heads and halberts in their hand;
> And party-colored troops, a shining train,
> Drawn forth to combat on the velvet plain.

Playing cards were introduced into Europe about the middle of the 14th century. They probably came from Asia, either introduced by returning crusaders or through commerce with the Saracens and Moors of Northern Africa. An old Italian chronicler supports the latter view, for he says: "In the year 1379 the game of cards was introduced into Viterbo (in central Italy), coming from the land of the Saracens, where it is called *naib*."

At first, packs of cards were painted by hand and the price was very high. The accounts of the French king Charles VI, for the year 1392, show the payment to a painter of a sum equal to $500 "for three packs of cards in gold and various colors, ornamented with different designs." Even before the invention of printing from movable types, the new art of "block printing" (engraving) was applied to the manufacture of playing cards, between 1420 and 1430. The result was that the price was greatly reduced and the use widely spread. The city of Ulm in Germany became one of the chief centers of the manufacture.

It would be a dizzy chase to follow in detail the evolution of the pictured royalties on the cards and their "shining trains." One theory holds that on the early Italian cards the four "suits" represented the four classes of society—nobles, peasants, clergy, and citizens. The early German cards, however, mark the suits respectively with hearts, bells, leaves, and acorns. Our familiar hearts, clubs, spades, and diamonds come to us from the French.

The "face" or "court" cards of the early packs were the king, knight, and valet ("jack" or "knave," at times known as the court fool). The Italians substituted a queen for the knight, and this is now the usual custom. Today 52 cards usually make up the pack in America, with a 53d card called the "joker" added for use in certain games.

CARIBBE'AN SEA. A great arm of the Atlantic Ocean, 750,000 square miles in extent and inclosed by the eastern coast of Central America, the northern coast of South America, and the long sweeping crescent of the West Indies—such is the Caribbean Sea, so named from the Carib Indians who once inhabited its islands and shores. Here is the crossroads of the western world, for through it passes the trade of the Panama Canal and a great part of our commerce with Central and South America. The greatest width of the Caribbean, from Porto Rico to Panama, is more than 700 miles; and its length, from Yucatan on the west to Trinidad on the east, is 1,700 miles.

In this "American Mediterranean," the interests and authority of the United States are dominant. For more than a century the course of events has been forcing that country to recognize its responsibilities in keeping order in the Caribbean lands and in assisting their peoples to advance in the paths of sanitation and orderly progress. This commanding position of the United States began with the formulation of the Monroe Doctrine; it was completed through the liberation of Cuba, the acquisition of Porto Rico and the Virgin Islands, the assumption of a protectorate over Haiti, and by digging the Panama Canal.

Once the Caribbean was the favorite haunt of buccaneers and pirates, who especially infested the waters north of Colombia and Venezuela, the "Spanish Main" of the old days. Now, aside from the Panama traffic, it is traversed chiefly by fleets of leisurely ships that convey the sugar, coffee, cacao, and bananas of the tropics to the United States, and take back manufactures in exchange. The sea is comparatively free from rocks and reefs, except near the islands, but frequent hurricanes take a terrible toll of shipping. These storms are caused by the superheating of the warm waters of the equatorial current, which sweep across the Atlantic from Africa and remain pent up in the Caribbean, or slowly make their way through the narrow Yucatan Channel—120 miles wide—into the Gulf of Mexico, and thence through the Florida Strait and northward as the Gulf Stream. As the hot air above these waters rises, the cold northern and eastern trade winds rush in with terrific force, often laying low houses and plantations on the islands and sending staunch ships to the ocean bottom.

The bed of the Caribbean Sea is a vast submarine mountain system, with deep valleys and lofty peaks. The easternmost chain rises above the surface of the waters to form the West Indies archipelago. Nowhere else, scientists say, can there be found such contrasts of ocean depth within such short distances. Long ridges approach the surface in places and then fall away on both sides in submarine precipices three miles deep. In these abysses strange creatures are often brought up by dredging, quite unlike those found anywhere else. Some of them closely resemble fossil forms supposed to have been extinct for hundreds of thousands of years.

CARIBOU. This is the name given the wild reindeer of North America. They lack the symmetry and grace of the true deer, the body being heavy, the legs thick and sturdy, ending in large broad spreading hoofs. Large irregularly branching antlers are borne by both males and females, but are smaller and more slender in the females.

There are two types of caribou. The woodland caribou inhabits the same forests as those which shelter the moose—from Alaska and Canada to northern Maine and Minnesota, and in the Rocky Mountain region to Idaho and Wyoming. It is neither so swift nor so shrewd as the moose, falling an easy prey to hunters and to wolves, and is in danger of being exterminated within the United States. The Barren Ground caribou resembles its woodland relative, but is smaller and paler in color. It roams the desolate Arctic barrens and tundras beyond the limit of trees. Its northermost range is said to be beyond 83° of north latitude. Early explorers in Alaska and the region east of Bering Strait found herds numbering hundreds of thousands.

When alarmed these caribou break into a clumsy gallop which soon changes to a steady shambling trot that carries them rapidly across country. Their large spreading hoofs, with sharp cup-shaped edges, are admirably adapted to secure a firm footing in the yielding and hummocky surface of their summer haunts, and on the ice and snow in winter. (*See* Deer; Reindeer.)

Scientific name of woodland caribou, *Rangifer caribou;* of Barren Ground caribou, *Rangifer arcticus.*

CARLYLE (*kär-līl'*), **THOMAS** (1795–1881). A careless servant-maid in the house of John Stuart Mill, the English philosopher, one morning entered his study to light the fire. On the floor near a table lay a disordered pile of manuscript. To save herself trouble she thrust this paper into the grate and used it to kindle the fire.

That manuscript, destroyed in a few moments through the thoughtlessness of a lazy girl, was the manuscript of Thomas Carlyle's great work, the 'French Revolution', on which he had worked five weary months. He had sent the precious document to his good friend Mill to be read and criticized.

When Mill discovered the appalling loss, he was almost frantic with grief. In a state bordering on madness he rushed to Carlyle's house. Carlyle was stunned by the blow, but he did not utter a word of reproach. Gently he tried to console his friend, and when Mill had gone back home, his thought was not for himself, but for Mill. He said to Mrs. Carlyle:

"Mill, poor fellow, is terribly cut up. We must endeavor to hide from him how very serious this business is for us."

And terribly serious it was, for Carlyle was poor, and earned his bread and butter by his pen. The blow was so heavy that weeks passed before he could bring himself up to the task of rewriting the book.

THOMAS CARLYLE
"Grim, fire-eyed, defiant"

We should remember the greatness of heart Carlyle showed on this occasion, when we read of the irritability and crabbedness he displayed at other times. And we should remember that toil and pain were his companions throughout life. He suffered dyspepsia, which, as he said, "gnawed like a rat at his stomach," filled his mind with gloom, and goaded his fierce temper into violent outbursts. His haggard features, lined with pain and thought, told of suffering and struggle; but his whole bearing showed a rugged strength which could not be subdued. The older he grew, the brighter glowed his deep-set eyes, and nothing could quench his fiery spirit.

There was an intense earnestness in Carlyle, a hatred of sham, hypocrisy, and weakness, that found expression in everything he wrote. Again and again he preached his gospel of work: "Whatsoever thy hand findeth to do, do it with thy whole might. Work while it is called Today; for the Night cometh, wherein no man can work." "Carlylese" is a word that has been coined to describe his style, for his writing is full of sudden ejaculations, rich in glowing words and vivid pictures, rugged and tempestuous.

The son of a hard-working stone-mason, Carlyle was born at Ecclefechan, a little village in the lowlands of Scotland. The story of his early struggles he afterwards told in his 'Sartor Resartus', one of the strangest books ever written, seemingly a planless jumble of ideas, but full of deep wisdom and insight. After years of privation his twice-written 'French Revolution' brought him recognition.

His triumph reached its climax with the publication of his 'Frederick the Great', a massive work on which he labored 14 years. He was honored by election as lord rector of Edinburgh University, and went there to deliver his inaugural address on 'The Reading of Books'. Before he returned home, he received news of the sudden death of his beloved and brilliant wife. He never recovered from this blow, but remained a sad and lonely man, till he followed her in his 86th year.

Carlyle's chief works are: 'Life of Schiller' (1823–24); 'Sartor Resartus' (1833–34); 'French Revolution' (1837); 'Heroes and Hero-Worship' (1841); 'Past and Present' (1843); 'Life and Letters of Oliver Cromwell' (1845); 'Latter-Day Pamphlets' (1850); 'Frederick the Great' (1858–65).

CARNATION. For more than 2,000 years men have cultivated the fragrant carnation, which is a developed form of the clove pink found in our old-fashioned gardens. It is a hardy plant, which usually thrives even in wind and cold and in smoky districts. We know that Shakespeare admired its beauty, for he has Perdita in 'The Winter's Tale' say,

> The fairest flowers o' the season
> Are our carnations and streak'd gilliflowers.

But our carnations are fairer than Shakespeare's, for the carnation lends itself readily to man's tinkering. Most of our large aristocratic carnations with their many beautiful colors and shapes are the results of patient crossing and selection, especially in the last few decades.

In America hundreds of improved fringed-petaled varieties of monthly, tree, or perpetual flowering carnations are extensively grown under glass. Hundreds of hothouses are given up mainly to carnations, producing annually for the markets of the United States and Canada upwards of one hundred million flowers. Specialists devote themselves to the diseases of the carnation. Many of these new varieties of red, white, pink, yellow, and striped blossoms are now grown in Europe too.

Scientific name of carnation, *Dianthus caryophyllus*. It grows on a more or less erect branching stem from two to three and a half feet high, and has opposite grasslike leaves covered with a bloom, and solitary terminal flowers that are perfumed and variously colored. (*See* Pink.)

CARNEGIE (*kär-nĕg'ĭ*), ANDREW (1835–1919). No story-book hero ever had a more romantic history than this great ironmaster and philanthropist. At the age of 10 he was a poor bobbin-boy in a cotton factory. Fifty years later, a self-made multimillionaire, he was engaged in the unique business of giving away his vast fortune in accordance with his belief that "the man who dies possessed of wealth which he was free to distribute, dies disgraced."

Andrew Carnegie was born at Dunfermline near Edinburgh, Scotland, at a time when machines and the factory system were displacing the old household manufacture of woolen cloths. His father, an old-time hand-weaver, removed to the United States, where he found work for himself and his son in a cotton mill near Pittsburgh. The death of the father left the lad at 16 to support his mother and younger brother from the slender salary of a telegraph messenger boy.

Self-taught, he soon became an operator, then train dispatcher, and later, secretary to the general superintendent of the Pennsylvania Railroad. Adding his scanty savings to borrowed money, he invested in the first company to manufacture sleeping cars, which were soon adopted by the Pennsylvania Railroad. The dividends from this investment were put into oil lands, and thus his career as a capitalist began.

The outbreak of the Civil War found Carnegie the superintendent of the Pittsburgh division of the

Pennsylvania system. He gave up this post to take charge of the eastern military railroads and telegraph lines for the government, and was the third man wounded on the Union side, while removing obstructions from the Washington tracks. His ability as an organizer was such that in his department there were no scandals and no breakdowns during the entire time of his service.

ANDREW CARNEGIE

The man who gave $350,000,000 to help his fellow men.

The next important step in Carnegie's business career was his formation of the Keystone Bridge Works. His keen foresight led him to forecast the replacing of the old wooden bridges with iron ones, and his company built the first iron bridge across the Ohio River. This soon led up to the establishment of iron mills, and a bit later to the manufacture of steel by the Bessemer process, hitherto unused in America, and which the canny Scot quietly adopted after an observation visit to England.

From this point the story for a time has to do with the way in which, under his magic hand, great plant after plant sprang into existence. Within 25 years of the formation of his first company, Carnegie was able, in 1899, to consolidate the immense steel works centering about Pittsburgh into the great Carnegie Steel Company. Two years later, at the height of his phenomenal business career, he transferred his steel interests, at a valuation of $500,000,000, to the United States Steel Corporation, and retired from the industrial world to devote his entire attention to a new existence consecrated to public service.

In disposing of his great fortune, the largest ever acquired by a foreign-born American citizen, he was determined to make each gift of the highest possible value to humanity. He held that indiscriminate giving is mostly sheer mischief. "No person," he said, "and no community can be permanently helped except by their own coöperation." So each gift usually carried with it stipulations that not only stimulated to greater effort, but also required coöperation from the recipient.

One of the earliest gifts by Mr. Carnegie was to supply pensions and relief for the injured and aged employees of his steel plant. "This," he said, "was only an acknowledgment of the deep debt which I owe to the workmen who have contributed so greatly to my success." The largest sum given by him for any single purpose was for establishing public libraries. This was the outcome of a boyish resolution to imitate a public-spirited man who had opened his private library to the mill-boys of his early Pennsylvania home. He also created a Hero Fund for rewarding such deeds of heroism as might otherwise receive only slight appreciation.

But the greater part of his vast fortune he distributed for various educational and scientific purposes, such as gifts to existing colleges and universities, endowments for new institutions like the Carnegie Institute of Technology at Pittsburgh, and for improving college and university teaching by providing a pension fund for such teachers. He further provided for the permanency of these educational benevolences by establishing the Carnegie Corporation with a fund of $125,000,000, to be used as its trustees saw fit.

The great task he had set himself, too, was but partially accomplished when in 1919 Mr. Carnegie was overtaken by death. According to a statement issued at that time, his gifts since 1901 were as follows:

For 2,800 libraries	$ 60,000,000
Colleges and universities	30,000,000
Church organs	6,000,000
Carnegie Corporation	125,000,000
Carnegie Foundation for Advancement of Teaching	29,000,000
Carnegie Institute of Technology	13,000,000
Carnegie Institution of Washington (for scientific research)	22,000,000
Carnegie Hero Fund	10,000,000
Carnegie Endowment for International Peace	10,000,000
Hague Peace Palace	1,500,000
Dunfermline Trust	3,500,000
War grants	2,700,000
Other gifts	37,300,000
Total	$350,000,000

CARP. A widely distributed food-fish. In addition to the carp proper, the chub, dace, shiners, goldfish, etc., are included in this group. (*See* Fish.)

CARPA'THIAN MOUNTAINS. Stretching like a mighty bow for 800 miles through the former Austrian dominions, from Pressburg on the upper Danube to Orsova on its lower course, lie the majestic Carpathian Mountains. They are second only to the Alps in importance for European geography. Their magnificent arc of towering peaks, rolling wooded hills, and deep shaded valleys almost surrounds the fertile plainlands of Hungary, precipitating the rains from the south and protecting the plains from the cold northeast winds. The lower slopes are covered with forests of giant pines, but on the higher elevations the trees are sparse and stunted, disappearing altogether on the rugged granite peaks, which are bare excepting for the grayish mosses and silvery lichens that cling to the rocks. Snow covers the peaks for about nine months of the year, and on some of the mountain tops are small salt lakes which the peasants call "eyes of the sea" because of their blueness and because they believe them to be connected with the sea by underground channels undiscovered and unexplored by man. In the forests still roam wild beasts—bears, wolves, and lynxes; and great eagles and other birds of prey soar through the clear sky, their forms reflected shadowly in the mirror-like lakes below. Some of these peaks are more than 8,000 feet high, but in general the elevations are only from 3,000 to 5,000 feet.

All through these wild mountains are great mining shafts, for the richest mineral deposits of all Europe lie in this district. Gold and silver are found in quantities; also copper, lead, zinc, iron, coal, and petroleum. Great veins of rock salt underlie the upland plateaus, sometimes reaching a thickness of 600 feet, and tunnels traverse these deposits for mile after mile underground. Mining and forestry furnish occupations for many of the mountain people, but considerable farming also is carried on. Grain and vegetables are raised in the valleys, while flourishing orchards cling to the steep sides of sunny slopes.

CARPETS. Carpets are distinguished from rugs in that they usually cover the entire floor, whereas the latter cover only a portion of it. (*See* Rugs and Carpets.)

CARROLL, LEWIS (1832–1898). In real life this English author, whose 'Alice in Wonderland' and 'Through the Looking Glass' are such universal favorites, was named Charles Lutwidge Dodgson. Strange to say, his life-work was as professor of mathematics in Oxford University. This is perhaps why, when he came to write his delightful books for children, he took a different pen-name. Even stranger is the fact that he had no children of his own, being an "old bachelor" whose knowledge of children was derived merely from playing with the children of his friends.

The real Alice was the daughter of his friend Dean Liddell. Long afterwards she gave this account of how these whimsical stories, which still delight readers of all ages and all countries, were first told to her and her two sisters:

"Most of Mr. Dodgson's stories were told to us on river expeditions near Oxford. I believe the beginning of 'Alice' was told one summer afternoon when the sun was so burning that we had landed in the meadows down the river, deserting the boat to take refuge in the shade of a new-made hayrick. Here from all three came the old petition of 'Tell us a story', and so began the ever delightful tale. Sometimes to tease us—and perhaps being really tired—Mr. Dodgson would stop suddenly and say, 'And that's all till next time!' 'Ah, but it *is* next time!' would be the exclamation from all three, and after some persuasion the story would start afresh."

When the stories were published in book form, they owed much of the immediate fame which they won to the delightful drawings with which they were illustrated by the English cartoonist and artist, Sir John Tenniel.

The STORY *of* ALICE *in* WONDERLAND

ONE sunny afternoon when humming bees and warm winds made her drowsy, Alice lay in the shade of a great tree. The dear little girl's drooping eyes had almost shut, when suddenly she saw a white rabbit with pink eyes. As he scurried past he looked at a watch which he took from his pocket. Then he hurried faster than ever, as though he had to catch a train; and after him ran Alice, for she had never seen so strange a thing as a rabbit with a watch, nor one with a pocket to put it in.

Through a tunnel she followed him into a high room hung with lamps and lined with big doors. A small three-legged table made all of shining glass stood in the center of the room. On it was a little golden key, but the locks on the doors were large and the key fitted none of them. Behind a curtain she found a door just 15 inches high. Of course she couldn't go through it, even when the golden key had opened it, for she was much too large; but by stooping she could see the dearest little garden, all tiny trees and flowers and lovely grass and splashing fountains.

So many queer things had happened that it didn't surprise Alice a bit to find a bottle lying on the table with the words DRINK ME printed in large plain letters. She looked carefully to see if *Poison* was on the label, too, but it wasn't, so she drank!

"What a curious feeling!" said Alice. "I must be shutting up like a telescope."

The Ups and Downs of Alice

Which indeed she was. She shrunk and shrunk until she was only ten inches high. She was small enough then to go through the little door into the little garden. But where was the golden key? Several feet above her, shining through the glass of the table! Oh dear! She wasn't tall enough to reach it!

Alice was so vexed that she cried. Then, being a sensible little girl, she looked about her to see what could be done. And there, right beside her, lay a cake, with EAT ME spelled on its top with currants.

"Curioser and curioser!" cried Alice. "Now I'm opening out like the largest telescope that ever was! Good-bye, feet!" For as she ate the cake she grew so tall that she never expected to see her feet again. She could easily reach the key now, but what was the use? Only by lying on her side, and putting one eye up very close to the tiny door, could she even see into the garden.

Great girl as she suddenly was, she cried and cried until she heard the patter of feet. There was the White Rabbit again, and looking quite worried, And he was in such a hurry that he dropped his gloves and fan as he disappeared. Sadly Alice picked them up. She had hoped that the White Rabbit would help her.

Looking down at her once distant feet she saw them coming nearer and nearer, and she dropped the fan just in time to keep herself from going out altogether, like a candle. She was now so small that when she fell into the pool of tears which she had just shed, she had to swim to keep from drowning.

She sat on the bank to dry in the queerest company. There were small birds, a mouse, and many creatures that she had never seen before. The Dodo, a great bird with a clumsy beak, suggested a Caucus-race as a good way of getting dry.

What a Funny Kind of a Race!

He marked out a race-course, in a sort of circle, and then all the party were placed along the course, here and there. There was no "One, two, three, and away!" but they all began running when they liked and left off when they liked, so that it was not easy to know when the race was over, until the Dodo said it was.

Quite without warning Alice found herself alone in a strange place, but the White Rabbit, who was entirely unafraid of this little girl who was now no bigger than he, sent her to fetch his gloves. She found them in his cunning little house. But unfortunately she also found a bottle, and without stopping to think she drank its contents.

And there she was big again! Perfectly e-*nor*-mous! She was so big that she had to put an arm out of the window, and a foot up the chimney, because there was no room for them in the house. Finding her in this terrifying state, the White Rabbit nearly jumped out of his skin. He and the gardeners tried every way to get Alice out of the tiny house. Finally they began throwing pebbles through the window. As these turned to cakes, which Alice ate, she soon shrunk enough to run out of the house and hide in a forest.

A wise and cross old caterpillar who sat on a mushroom smoking a long pipe talked to her in a most unpleasant way, asking a great many foolish questions that she couldn't answer. As he left, in a bad temper, he called out:

"One side will make you grow taller, and the other side will make you grow shorter."

"One side of *what*? The other side of *what*?" thought Alice to herself.

"Of the mushroom," said the caterpillar, just as if she had asked it aloud.

Now the mushroom was perfectly round, but Alice broke two pieces off on opposite sides. She had just nibbled one when she shrank so suddenly that her head struck her foot. Then she bit the other piece, and her neck stretched up and up until she could only see the trees of the forest as a carpet of green, 'way below her. By taking the tiniest bites from one and then the other piece, she finally made herself about the size of a fairy, which is just the right size, as every child knows.

From the forest Alice saw a little house. She knocked timidly on the door, but there were such extraordinary noises of howling, sneezing, and smashing things, from the inside, that nobody heard her. Opening the door she found herself in a large smoke-filled kitchen.

The Duchess was sitting on a stool holding a baby who was howling and sneezing because the air was filled with pepper. Every now and then the cook turned from peppering the soup and hurled a plate or a kettle in the general direction of the Duchess. That lady paid no attention, but sang a lullaby:

Speak roughly to your little boy,
And beat him when he sneezes;
He only does it to annoy,
Because he knows it teases.

When she had finished singing she threw the baby to Alice. "Here! You may nurse it a bit, if you like!" and left the bewildered little girl with a baby that very soon turned into a pig. When Alice put it down it trotted happily away.

And Here is the Famous Tea Party

She next came to a house before which a long table was spread for a tea party. Crowded around one corner were the March Hare, the Mad Hatter, and the Dormouse. They were very rude and cried out "No room!" as soon as they saw Alice coming.

"There's plenty of room!" she said indignantly, and sat down.

JUST LOOK HOW THEY TREATED ALICE!

This is exactly how it was—Alice coming in so friendly, the Mad Hatter and others crying out "No room!" and the March Hare fixing on her that stony stare. But the poor old Hatter really couldn't help looking that way, nor seeming so rude, perhaps. You remember, there was much that was wrong under that hat!

"Take some more tea," said the March Hare with mock politeness.

"I haven't had any, so I can't take more." They had neither sense nor manners, so Alice left the mad tea party just as the rest began to stuff the sleepy Dormouse into the teapot.

When she found her way back to the hall with the little glass table, she took the golden key, and nibbling at her bits of mushroom until she was about a foot high, she ran through the tiny door into the garden.

The Duchess, the White Rabbit, and the King and Queen of Hearts were playing croquet. Alice joined them, but the Queen cried "Off with his head" so often that there were soon no players left. The Queen then took Alice to visit the Mock Turtle and the Gryphon, who sang songs and danced, and told amusing stories about when they were young.

"The trial, the trial!" the Gryphon cried in sudden excitement, and ran very fast, pulling Alice after him.

The Knave of Hearts was accused of having stolen some tarts that the Queen had made. The trial was so foolish and unfair that Alice became quite angry. Feeling herself grown to her natural size, and suddenly realizing that these were not real people after all, she jumped up crying:

"You're nothing but a pack of cards!" and she scattered them all about.

At that she woke up. Her head was in her sister's lap, as it had been when she first saw the White Rabbit, and her sister was smiling and telling her it was tea-time.

CARROTS. Have you seen the fields and roadsides white in late summer with large spreading weeds that make you think of lace parasols? You perhaps know them by the name of Queen Anne's lace, but they are really the wild form of the carrot—a weed which is cordially hated by farmers. If you plant the seed of this wild carrot in rich garden soil, its white root will become more fleshy, and in a few generations it will resemble that of the plant we eat.

Carrots have been cultivated since very ancient times. During the reign of Queen Elizabeth, Hollanders introduced them to England, where they grew rapidly into esteem. Indeed, we are told that in the time of James the First ladies adorned their headdresses with the feathery leaves. Carrots are grown everywhere in the United States, both commercially and in the home garden.

Carrots differ widely in the shape and color of their roots. White carrots are grown chiefly for cattle, and red, orange, or yellow for table use. There are early, medium, and late varieties, and, like potatoes, they are found in our markets the year round. Table varieties may be sown as soon as the weather is settled in spring. Stock carrots mature late, growing best during the cool weather of the fall. They require a loose soil that will allow the roots to expand, preferably a rich sandy loam.

The carrots belong to the parsley family, as you might guess from the resemblance. Scientific name, *Daucus carota*.

CARSON, "KIT" (1809–1868). In the same way that Daniel Boone was the explorer and frontiersman connected with the opening of Kentucky to the white men, so Christopher Carson, popularly known as "Kit" Carson, was the most famous guide and trapper in the great region west of the Mississippi River. He was born in the sparsely settled state of Kentucky, but while he was still an infant his family moved farther west to Missouri. His father wished him to learn a trade, and so apprenticed him to a saddler; but the life of a hunter appealed to Carson, and for many years he made his living by hunting and trapping.

When John C. Fremont in 1842 started on his explorations of the great western plains, Kit Carson accompanied him as guide, and during the Mexican War he served with Fremont in California. Other trips across the country were made in 1849 and '50, when he convoyed the gold-seekers to the Pacific coast and protected them against the Indians. On one trip he drove 6,500 sheep across the plains.

Carson always exercised a tremendous influence over the Indians, and after his appointment as Indian agent at Taos, N. M., in 1854, he frequently kept warlike Apaches from massacring the whites.

During the Civil War Carson rendered valuable services on the frontier by acting as chief scout of the irregular troops who were carrying on a border warfare in that part of the Union. For his services he was made brigadier-general of volunteers in 1865, and was reappointed Indian agent at the close of the war. Carson City, the capital of Nevada, was named in his honor.

CARTHAGE. About 1,000 years before the birth of Christ the venturesome Phoenicians planted on the edge of the region now called Tunis, in northern Africa, the city of Carthage, which became the commercial queen of the western Mediterranean until overthrown by its powerful rival, Rome.

According to tradition, Carthage was founded by Queen Dido, who had fled from Tyre in Phoenicia. The inhabitants about Carthage agreed to give her as much land as could be compassed by an ox-hide. Dido cut the hide into small strips and thus surrounded a large area on which she founded the city. There, according to Vergil's 'Aeneid', the Trojan warrior Aeneas visited her, on his wanderings after the fall of Troy (*see* Aeneas).

The advantageous situation of Carthage gave it unrivaled commercial opportunities, and it became a large and splendid city, with docks and piers teeming with ships and merchandise. Behind these the city spread far inland, with spacious markets and busy manufacturing quarters humming with slave industry. The trade of Carthage was carried to all parts of the known world. Her colonies sprang up in northern Africa, in Spain, and in the islands of the Mediterranean; and her ships controlled the inland sea.

After Rome had gained the mastery of Italy, that city soon came into conflict with Carthage; for without the permission of Carthage, as one of her officers boasted, "no Roman might even wash his hands in the Mediterranean." As a result there began the series of conflicts known as the Punic Wars, between Rome and Carthage, which lasted for more than a hundred years. The first war (264–241 B.C.) was fought in Sicily and ended in the withdrawal of the Carthaginians from that island and the payment of an indemnity to Rome.

The second Punic war (218–201 B.C.) is sometimes called the war with Hannibal, from that great Carthaginian general (*see* Hannibal). He invaded Italy from Spain, crossing the Alps with a train of elephants and performing prodigies of valor. Although he crushingly defeated the Romans at Cannae, the subject Italians failed to come to his support. In the end he was recalled to Africa, where the Roman Scipio Africanus was attacking Carthage itself. This war ended with yet more severe terms for Carthage, including her withdrawal from Spain and the surrender of her navy.

The third war (149–146 B.C.) was caused by the jealousy of Rome at signs of reviving commercial and maritime strength in Carthage. After a heroic resistance, in which Carthaginian women cut off their hair to make bowstrings for the catapults or hurling machines, their city was taken. For some years the harsh Roman senator Cato had ended every one of his speeches—no matter what the subject—with the words, "Carthage must be destroyed" (*Delenda est Carthago*). This policy was now adopted, and Carthage was razed to the ground.

A city was later built on the same site by Augustus and became the Roman seat of government in Africa. When the Vandals overran the region, Carthage became their capital; but when the Arabs captured it in 647 it was again destroyed. Today only a few miserable hamlets and ruins mark the site.

CARTIER (*kär-tyā'*), JACQUES (1491–1557). There is scarcely a promontory or bend along the lower reaches of the St. Lawrence River that does not carry memories of the bold French sea-captain, Jacques Cartier, who in the early years of the 16th century discovered and explored that great stream and opened Canada to white settlement. But Cartier was a modest man and wrote nothing of himself. Little is now known of his early years, beyond the fact that he was a hardy Norman sailor. He first appears in historical records as the master of a tiny sailing vessel which set out from St. Malo on April 20, 1534, to seek a passage to the East Indies around North America. He reached Newfoundland on May 10, passed through the strait of Belleisle, and landed at several points inside the Gulf of St. Lawrence.

Struck by the mildness of the summer climate, and by the abundance of flowers and fruits growing on these shores, Cartier entered into friendly trade with the Indians of these regions. It is said that some of these simple-minded savages stripped themselves of all their winter furs in exchange for a few beads and hatchets, which they believed were magic gifts from the strange "white gods." Two of the Indians returned to France with Cartier in the autumn of 1534, and he gave such glowing accounts of the new land that he obtained from several wealthy patrons three ships for his next voyage, This began in May 1536, and led him far up the St. Lawrence. He camped on the north shore at the Indian station of Stadacona, near the site of modern Quebec, where he found a paradise of trees and vines and fertile soil.

JACQUES CARTIER MEETS AN INDIAN

The artist here shows us the famous explorer landing on the banks of the St. Lawrence in the course of his explorations upstream to the site of Montreal. The Indian is warning Cartier of dangers ahead, but the bold Frenchman refuses to turn back.

His men wanted to remain there, but Cartier had heard of greater wonders farther upstream, so he took one of his ships and two large Indian boats and pushed on to where the St. Lawrence widens out into Lake St. Peter. There the shoaling water forced him to abandon the ship, and he proceeded in the boats as far as the big fortified Indian village of Hochelaga, situated on an island at the point where the Ottawa River flows in from the north. Here he found a high hill, from which he surveyed the vast stretches to the westward. In the name of the King of France he took possession of this great land and called the hill Montreal (Royal Mount.) The exploring party returned to Stadacona for the winter, and there 25 of Cartier's men died of scurvy. The following spring he returned to France.

What Cartier chiefly sought in these voyages to the St. Lawrence was what many others were seeking in different parts of America at that time, namely, a strait or water passage through the unknown continent to the ocean which washed its western shores. When he found that his way beyond Montreal was barred by rapids in the St. Lawrence River, he named these "the China Rapids," for he hoped that when they were once passed, a way to the East might there be found.

In 1541 he was sent out again by King Francis I, with five vessels, to prepare the way for the first colonizing expedition to Canada, a task entrusted to François de la Roque, seigneur de Roberval. Cartier left De Roberval searching up the Ottawa River for the mythical "Kingdom of Saguenay," which the Indians had described as rich in precious stones. In 1543 Cartier was sent on his fourth voyage, to bring back De Roberval, who had failed in his mission. The remainder of Cartier's life was spent quietly in St. Malo, where he died on Sept. 1, 1557.

CARTWRIGHT, EDMUND (1743–1823). It is interesting to note how often chance figures in great discoveries and inventions. This clergyman of the church of England was 41 years old when a casual conversation turned him from the simple duties of a country parish to the checkered career of an inventor. He was a member of an old and wealthy family of Nottinghamshire, was educated at Oxford, and had devoted his talents to religion and literature. While on a vacation he met a party of gentlemen from Manchester, and there was animated talk of Arkwright the inventor, and of the flourishing spinning mills that were producing yarn faster than the old hand looms could spin it into cloth. "Your clever Mr. Arkwright should give his attention to the invention of a power-loom," Mr. Cartwright observed thoughtfully. He was told it could not be done, but the idea possessed him. He knew nothing of machinery and had never seen a loom in operation, but he set to work at the problem.

If you examine a piece of woven cloth, you will see that it is made up of two sets of threads which cross one another at right angles. The threads running lengthwise are called the "warp" and those running crosswise and interlacing are called the "weft." In the old hand-loom the shuttle which carried the weft was thrown by hand back and forth through the threads of the warp. After a year of experimenting, Cartwright in 1785 produced a machine, worked by water power, which would throw the shuttle back and forth of itself; at the same time it shifted the threads of the warp so as to interlace with the weft, and performed the other operations necessary in weaving. By later improvements he brought his invention to such a degree of perfection that every essential principle of it is retained in the wonderful looms in use today.

The introduction of the power-loom was violently opposed by the hand-loom weavers, and Cartwright's first mill of 400 looms was burned by rioting workmen. This calamity, together with expensive lawsuits to protect his patents, exhausted his large private fortune. Parliament, however, in 1809 voted him $50,000 as a reward for his inventions. On this he lived modestly for the rest of his 80 years, devoting himself to scientific experiments and inventions. He generously assisted Robert Fulton in working out some of the problems of the steamboat. He also invented the machine which is used today for making rope. Dr. Cartwright, as he was called, was for a generation a distinguished figure in London society, and he was universally mourned when he died in 1823. (*See also* Arkwright, Richard; Crompton, Samuel; Hargreaves, James; Spinning and Weaving.)

CASHMERE. In the north of India, reaching from the plains of the Punjab northward over the western Himalaya ranges to the borders of Tibet, lies the beautiful mountainous state of Cashmere (or Kashmir). It is a region of wild and gorgeous scenery, of splendid snow-crowned summits cut by deep gorges and valleys filled with rich and varied vegetation. It is traversed by the Indus River, and in the southwest the valley of the upper Jhelam widens out to form the famous Vale of Cashmere, celebrated in Thomas Moore's poem 'Lallah Rookh'—an oval cuplike basin 84 miles long and about 20 miles wide engirdled by mountain spurs which rise 14,000 and 15,000 feet above sea-level. In its marsh lands and flooded rice fields are mirrored the glory of the peaks, and for 30 miles along the valley the road threads its way past lake, river, hill, and temple, through a stately avenue of young poplar trees which march like a serried army across the plain. Within the vale lies the capital and largest city of Cashmere, Srinagar, a sort of mountain Venice, where the frail tenements of the poor and the elaborately carved villas of the rich huddle along the river in neighborly confusion.

Although Cashmere has an area of nearly 85,000 square miles, much of it is wild uninhabited mountain country, and the greater part of the population of more than 3,000,000 is gathered in the southwestern part. Its cool healthful climate has made it a famous summer resort for Europeans in India, and much of the prosperity of the natives is due to these visitors. From the wool of its goats, yaks, and wild sheep were made the celebrated Cashmere shawls, which first became fashionable in the reign of Napoleon. The great shawl industry was ruined, however, by the failure of the Paris market during the Franco-Prussian War of 1870, and the famine of 1877 scattered the weavers. The Cashmere carpet has to some extent replaced the shawl, but the most thriving industry today is that of silk weaving. The rose fields of the Vale of Cashmere give the finest attar, and Srinagar is noted for its silver work and wood carving. The staple crop of the valley is rice, and Indian corn, wheat, barley, and oats are also grown.

The natives are a fair well-featured race, with all the characteristics of the Afghans and northern races, but they are educationally very backward, with 98 per cent illiterates. The religion of the *Kashmiri*—as they are called—is chiefly Mohammedan, though Hindus, Buddhists, and Sikhs are a strong minority.

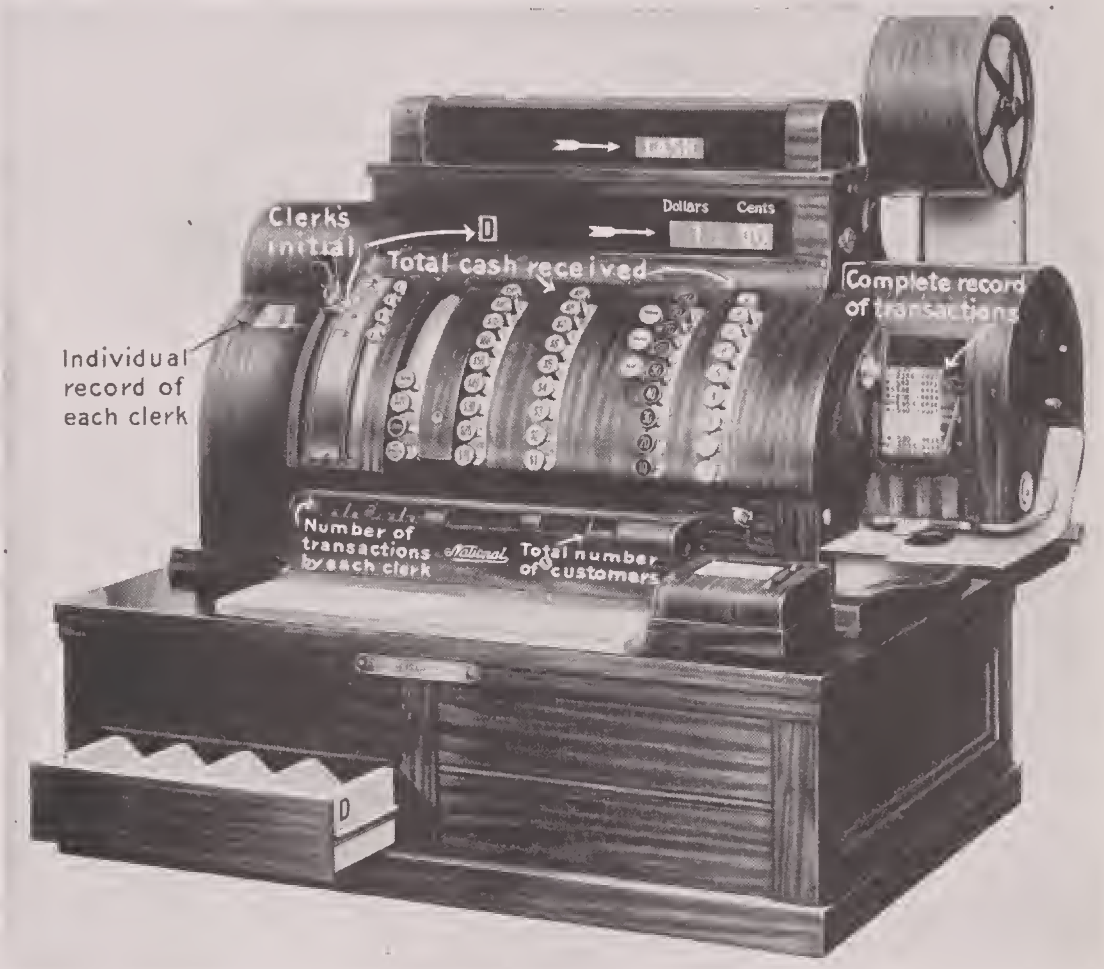
Owing to its mountain seclusion on the border of Tibet, a little out of the path of the many invaders that swept India from the northwest, Cashmere has known few political changes. But her population has always been ravaged by natural evils, like disease, fire, flood, and earthquake. The state is under direct control of the government of India. The Maharajah or ruler is a loyal friend of the British and fought in Flanders in the World War.

CASH REGISTER. In nearly 2,000,000 retail stores the world over, the cash register is used, registering money as it is received, keeping a record of the day's sales, and never making a mistake. This invaluable aid to modern industry was invented so short a time ago as 1879, and in its first form merely punched holes in a sheet of paper to show the merchant the total amount of the sales.

The inventor was Jacob Ritty of Dayton, Ohio, who conceived the idea during a trip on a steamer. He watched the device that recorded the revolutions of the propeller shaft and saw that a similar mechanism might be used to record the amounts of sales. The cash register of today, manufactured by the National Cash Register Company of Dayton, Ohio, is the direct descendant of the machine devised by Ritty.

In its improved form, the cash register is both an adding machine and a printing machine, and its complicated mechanism gives an amazingly complete record of the day's business. Not only does it register each sale and record the totals, but it also shows how much business each clerk has done, who has made a mistake, how much money has been taken in, and the number of "charge," "received on account," and "paid out" transactions that have been handled. It issues instantly a receipt on which is printed such information as the amount of the sale, the initial of the clerk who waited on the customer, the number of the sale, and the date. Each transaction is also recorded on a roll of paper; thus the proprietor has full information concerning every detail of his business, from the amount of his sales to the industry of each clerk. The cash register serves him as both bookkeeper and detective.

WHAT A MEMORY THIS MACHINE HAS!


CASH
Clerk's initial
D
Dollars Cents
Total cash received
Complete record of transactions
Individual record of each clerk
Number of transactions by each clerk
National
Total number of customers
D

Suppose you are a clerk and have just made a cash sale for a dollar. You tell the machine about it by moving the lever in upper left-hand corner down to the "D" mark, which is your signature, so to speak. Next you press the button to the right of the "D," and also the button marked $1. Then you push the button that starts the electric motor. This prints the record of the sale in the columns shown at the right, opens the cash drawer for you and pushes out a receipt which you hand to the customer. The machine also keeps track of the total amount of the sales, the number of customers, and the number of sales made by each clerk.

The mechanism is similar to that of a calculating machine (*see* Calculating Machine).

CAS'PIAN SEA. Lying on the boundary between Europe and Asia, the Caspian Sea is the largest salt lake and the greatest interior body of water in the world. It is about 700 miles long and varies in breadth from 130 to 270 miles; its area is about five times that of Lake Superior. With the exception of Persia on the south, it is entirely surrounded by territory which formerly belonged to the Russian Empire.

The great oil wells near Baku and the great fisheries at the river mouths give the Caspian its chief claim to commercial importance. Under settled conditions Baku, situated on the Apsheron peninsula, is the greatest oil center in Europe. Few other lakes or seas are so richly stocked with fish — sturgeon, salmon, carp, perch, etc. Large quantities of caviar, which is regarded as a great delicacy, are made from the eggs of the sturgeon.

In ancient days the Caspian was part of a much larger sea, which may have joined the Sea of Azof (a bay of the Black Sea) on the west, and included the Sea of Aral on the east. Today, however, the surface of the Caspian is 85 feet below the Black Sea and 240 feet below the level of the Sea of Aral. In the southern part it is very deep, reaching a maximum of 3,000 feet, but in the north there are numerous shoals. One peculiarity of the sea bottom is a ridge which seems to be a continuation of the Caucasus Mountains, though under the surface of the water.

The Caspian has no outlet, and consequently is a salt lake, though it is less salt than the ocean. The water is bitter and yellowish in color. The Caspian is fed by a number of rivers, among which are the Volga (one of the most important rivers in Russia), the Ural, the Terek, and the Kur. By a system of canals connecting the Volga, it is possible to reach the Black Sea on the west and the Baltic and White seas far to the north. The chief Caspian ports are Astrakhan, Baku, Derbend, and Astrabad, the latter being in Persia. Steamboats ply regularly on the Caspian and on several of its tributary rivers. On the south a low flat plain, from 15 to 20 miles in width, leads to the lofty range of the Elburz Mountains, while the north is bordered by great steppes. The Caucasus Mountains lie to the west, and the desert Transcaspian territory to the east.

HE CAN FIGHT IF HE HAS TO!

The cassowary looks funny and awkward when he sits down, but he's a champion runner and a fierce fighter.

CASSOWARY. This great running-bird, a near relative of the ostrich, the emu, and the rhea, looks at first sight like a bird without wings, tail, or feathers. But the tail is there, though so short that it is quite hidden under the strange, glossy-black, hairlike feathers that hang over it, and five stiff quills are the only visible part of the wing. The legs are short and heavy, with extremely powerful muscles. With its three strong claws the cassowary is a match for most jungle animals. The quills of the wings and the beak are also used in fighting.

The special feature which distinguishes this family from other great running-birds is the head, which is almost bare of feathers and carries a crest of bone, in some species flattened and in others rising like a helmet above the large beak. The bare neck is adorned with bright-colored wattles, red, yellow, or blue. The females stand from five to six feet high; the males are smaller.

Cassowaries are found in New Guinea, Australia, and some of the adjacent islands. They are forest-keeping birds, living mainly on fruit, bulbs, and insects. They nest on the ground in thickets. The three to six eggs are green, and it is the father who keeps them warm till the babies are hatched and guards the fledglings. The grown birds are very shy and such swift runners they are rarely caught alive.

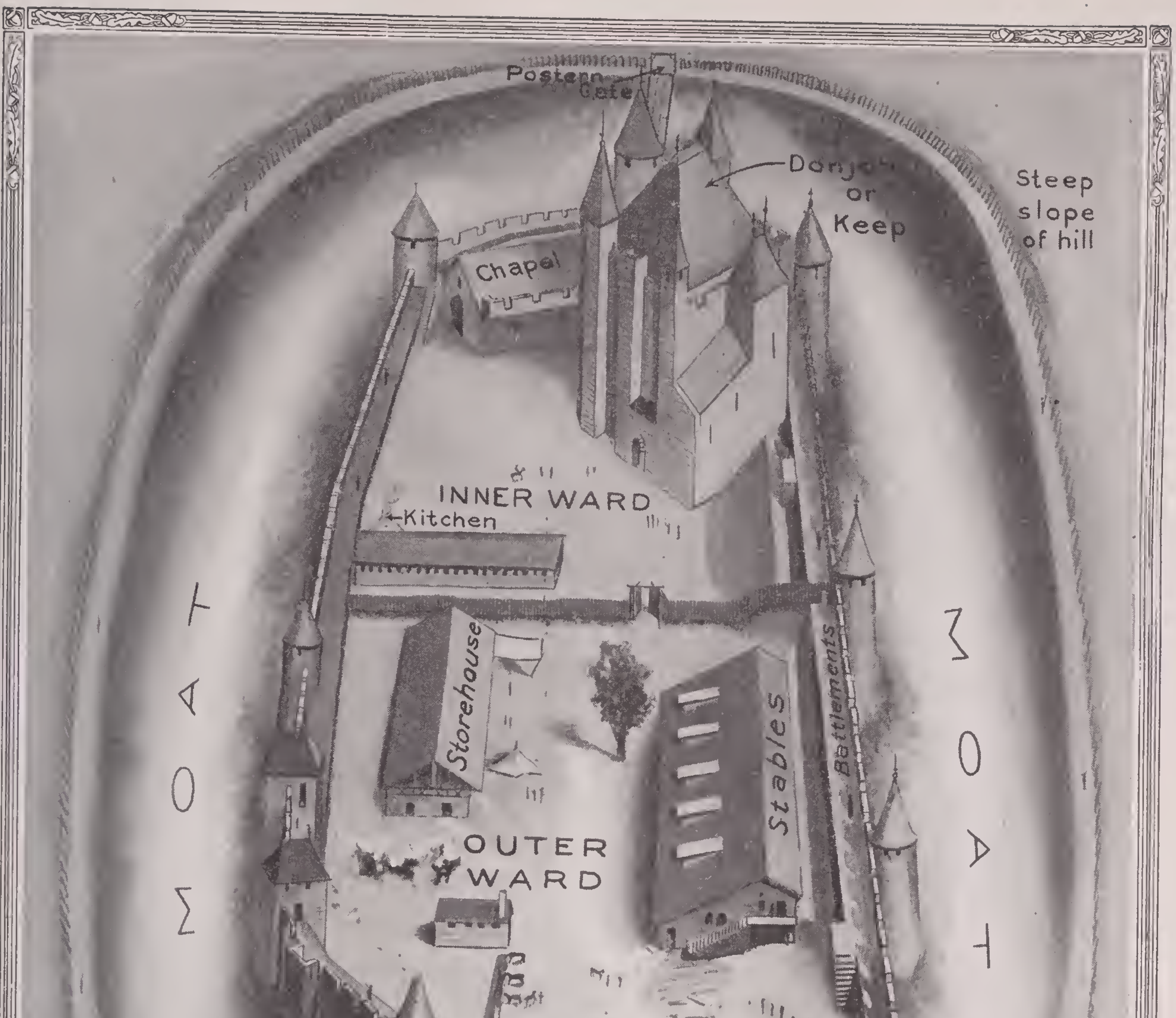
Scientific name of the Cassowary family, *Casuarius*. With the emus, it forms the group *Megistanes*.

When MOATED TOWERS *Ruled* EUROPE'S LANDS

HIGH above river and valley, on rocky crags which commanded roads, river fords, or mountain passes, perched, in the Middle Ages, the gray stone frowning castles of the feudal nobles, protecting and at the same time oppressing the serfs and villeins who lived in the straggling village at the castle's foot. Novelists and romancers picture these castles as splendid palaces in which fair ladies and brave knights led pleasant and joyous existences. In reality they were formidable fortresses, in whose construction reasons of war and defense overrode all considerations of comfort and pleasure. In this article we see the chief part of such a castle and its military defenses, and also catch some glimpses of the life led by the castle folk "when knighthood was in flower."

CASTLE. Making our way up the steep road which leads to a medieval castle, we find outside its walls a deep ditch or moat, with a strong palisade of heavy stakes set in the ground at its outer edge. The outer wall (called "curtain" or "bailey" wall) is of solid stone, 5 or 6 feet thick and 16 to 20 feet high. Along the top are frowning battlements, and at intervals of a bowshot rounded towers jut out from the wall's face, with loopholes so placed as to flank its base from attack by mining. Within these towers are circular stairs which lead from the battlements to the courtyard below. Between two larger towers is placed the intricately defended entrance to the castle enclosure.

If an enemy succeeds in crossing the drawbridges over the moat, he is confronted with a heavy wooden door which bars the entrance between the two towers. After this has been battered down he must pass a



This is a typical castle of the days "when knighthood was in flower." Before gunpowder was invented, a few brave men inside such a castle could hold it against almost any enemy except starvation. In the outer ward the country people took refuge in time of war, bringing provisions against a siege. In the donjon or "keep" in the inner ward dwelt the lord, his family, and dependents.

heavy iron grating called the portcullis, which has been dropped in the narrow passageway to bar his passage. And beyond this, perhaps, are yet other barriers, with staunch defenders thrusting with spears, hacking with sword and ax, and hurling missiles and melted pitch from vantage points above.

A FAMOUS CASTLE IN WALES

Carnarvon Castle is one of the strongholds erected by Edward I after conquering Wales in 1283. Most of the old bailey wall and its 13 towers still stands, a picturesque sight to the visitor.

Why Castles were Hard to Take

The entrance to the castle is indeed well guarded. And even after the portcullis has been pried up and the last barrier in the castle gate passed, the enemy finds himself only in an open courtyard. Here within the inclosure made by the bailey wall are the stables where the lord of the castle keeps his horses; here perhaps is the great brick oven in which bread is baked for the lord and all his villagers; and here too the villagers themselves seek shelter from the enemy. After this outer courtyard has been cleared of its defenders, the wall dividing the first and second courtyards must be carried before the second courtyard is reached.

Here again are a number of buildings used for different purposes. In one are the storeroom and cellars, where provisions are stored to enable the dwellers in the castle to withstand a siege. Next to this is a curious jug-shaped building with a large chimney at the top, and smaller ones in a circle round about. This is the kitchen in which the food is cooked for the lord of the castle and his whole household. In addition there is a small church or chapel in this courtyard, in which the castle inmates worship.

After this space has been cleared, the worn and weary enemy at last arrives at the tall "keep" of the castle, or the "donjon," as the French call it. In the lower part of this building are "dungeons" indeed for traitors and captured enemies. The walls of the keep are of stone and are eight to ten feet thick; and from the loopholes in its frowning sides peer skilled archers and crossbowmen ready to let fly their bolts and arrows at all below. A long siege will be necessary to starve out the defenders, for entrance can only be gained by a long causeway and drawbridge leading to the second story. If a siege is impractical, movable towers must be erected, battering rams used, stone-hurling machines (catapults and ballistae) employed, blazing arrows shot at the roof and windows, and tunnels dug to undermine the walls. Even when an entrance is gained, there will still be fierce fighting in the narrow passageways, in the dark halls, and on the winding stairways in the thickness of the walls leading from one story to another. And even when all is lost, there still remain underground passages opening into the moat, and a postern gate in the rear, through which the lord and his garrison may escape to the surrounding woods, and so continue the battle another day.

"Comforts of Home" in the Middle Ages

Perhaps you will inquire, Where do the lord and his family live in time of peace? Certainly there is not always war, though war is the chief interest of the lord. Sometimes they live in the upper stories of the huge donjon, where arms and supplies are kept. Because of its thick walls and narrow windows, the rooms are usually cold and dark in spite of the great fire that roars in the fireplace at the end of the hall. Before the 12th century there were no chimneys, just as there had been none in the days of ancient Greece and Rome; and the smoke escaped as best it might, as it still did in peasant cottages, through an opened window or a half-opened door. More comfortable halls for residence, apart from the donjon, were built at a later date, but still placed within the castle inclosure.

WHERE THE TIDE OF MANY AN INVASION TURNED

In troubled days of old, Stirling Castle was known as the "Key to Scotland," and these steep slopes have seen many a bloody encounter.

The furniture even of the separate hall is scanty, though substantial. About the stone walls, amid the weapons, hang embroidered tapestries, and skins are placed underfoot for the sake of warmth. Chairs and benches, tables, chests, and wardrobes stand about the hall, and at mealtime the servants place a long trestle-table down the middle of the room.

About this table all are seated according to rank. Before each is placed a knife, spoon, and a drinking cup, usually of wood or horn. Forks were unknown until the end of the 13th century, and separate plates or platters were rare. So the food is eaten from a common dish with the fingers. Before and after each meal pages bring basins of water and towels for washing the hands. There are no napkins; pieces of bread are used for cleansing the fingers during the meal, and then thrown under the table to the dogs.

Dinner, served at midday, is announced by the blowing of horns. It is a long and substantial repast, consisting often of as many as 10 or 12 courses. Wild boar and bear roasts alternate with roasts of swan and peacock, and with fish from the lord's fish-pond. The meats are roasted on spits before open fires, and are highly seasoned with pepper, cloves, and other spices. Even the wines are peppered and honeyed.

Amusements after Meals

After the meal is over, perhaps a wandering minstrel entertains the company with his songs of brave knights and fair ladies. Or they engage in games of chess, backgammon, and checkers. For outdoor amusements the nobles indulge in falconry, the tournament, and the chase. But these soon lose their charm, and the lord becomes bored unless he can engage in war with some of his neighbors, or better still with his overlord or king.

The stone castle or *château*, as the French call it, grew out of a much simpler fortification. In very early times the Frankish chiefs built wooden blockhouses on mounds of earth, around which they dug a broad ditch and built a palisade. This *castellum*, or fortified camp, was the ancestor of the castle. The castles erected in Anglo-Saxon England, and also those first erected by the Normans, were similar to the Frankish structures. Later the wooden tower was changed for one of masonry, and the palisade was replaced by stone walls. When the king in France or England gained control over the nobles, the feudal castles were either destroyed or were taken into his hands, so that they might no longer be a menace to the peace of the country.

CAS'TOR AND POL'LUX. These famous demigods of Greek myth were twin sons of Zeus, by a mortal mother. Pollux was renowned as a skilled boxer, and Castor was famed far and wide as a tamer of horses. Sailors in storms prayed to them, and they became the patrons of travelers and of hospitality as well of public games. According to one story, Zeus set them among the stars after their lives on earth, and the constellation of Gemini ("the twins") is named for them.

CASTOR BEAN. You have probably often seen the castor-oil plant as the center of a small circular flower bed, for although of tropical origin it is much used in northern countries for ornamental purposes. Given plenty of sunshine and a deep rich soil it will grow readily and lend a tropical appearance to your garden with its beautiful large leaves, even if it falls far short of the height of 30 or 40 feet attained by its cousins nearer the Equator. The castor plant is also grown commercially in the United States, but the highest yield of oil is secured in the tropics, India having long been the world's chief source of supply.

Most people, especially children, know to their sorrow that the oil derived from the castor bean is a most valuable medicine; but many are not aware of the large quantities used for other purposes. It is almost indispensable for lubricating airplane engines, for it is little affected by extremes of heat and cold in the varying altitudes. It is also used in the making of transparent soap, varnish, celluloid, artificial leather and rubber, sticky fly paper, and in the dyeing of cotton goods. Botanical name, *Ricinus communis*. (*See* Fats and Oils.)

CAT. The next time you play with pussy examine her with care and learn a lesson in natural history. Note particularly her large roundish head, the long slender body, rather short but muscular legs, and the long tapering graceful tail. Examine her feet and see how they are shod with soft pads so that her footsteps cannot be heard. Do not overlook her sharp strong claws, which may be drawn back or retracted into a sheath, so as to be out of sight and not easily felt. You may also observe that pussy can extend her claws at will and use them in catching and holding her prey.

THOSE WATCHFUL UNWINKING EYES!

She wouldn't touch a jug of cream right under her nose, if you told her not to—Oh, no! She looks *too* innocent, this Long-Haired Silver Kitty.

Then examine pussy's eyes. The shape of the pupils is elliptical. In bright sunlight the pupils are reduced to narrow vertical slits, but in cloudy weather, or after sundown, they are round and large to admit more light. This enables her to see at night, when she does most of her hunting; but cats cannot see in absolute darkness as some people believe. They merely see with less light than is required by most animals and human beings. Those long stiff hairs on either side of the cat's nose are commonly called whiskers; really they are sense organs, or feelers, and are very useful to the cat. Without them she could not stalk her prey in the dark. They give her timely warning of obstructions in her path.

By close observation and a few experiments you may discover that some of the cat's sense organs are highly developed, while others, such as taste and smell, are weak though not entirely wanting. The senses of sight, touch, and hearing are very acute in the cat. Its ears are so sensitive that it can hear the creeping of a mouse at a distance of many yards. But white cats with pink eyes (albino cats) are nearly always deaf.

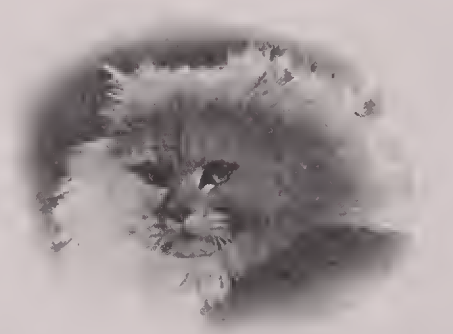
WHAT ARE YOU SMILING AT, LITTLE PERSIAN SMOKES?

All cats, young and old, seem to have a genius for graceful poses. "They're fine subjects," the photographers say.

"Cat" is not only the name of our common household pet. It is also the general name of a large family of carnivorous or flesh-eating mammals, which includes the lion, tiger, leopard, jaguar, panther, cougar, lynx, and a large number of smaller wild cats. The preceding description applies to all the members of the cat family, with only slight modifications. The pupils of the eyes in the larger members of the family are round, and a few forms, particularly the lynxes, have short tails. One form, the Manx cat—found in the Isle of Man in the Irish Sea—is tailless.

The habits and characteristics of all cats are much alike. All—except the lion, tiger, and cheetah—are good climbers. All prefer to hunt at night, and their usual method is to stalk their prey, or lie in wait for it and spring upon it unawares. They generally hunt singly, but sometimes in pairs.

A PERSIAN SMOKE IN GRAVER MOOD



Many ancient peoples believed cats were endowed with mysterious wisdom, and no wonder, when they can look so thoughtful!

Members of the cat family in a wild state are found on every continent except Australia. The breeding habits are similar in all species. The mother cat seeks a secluded spot that is sheltered from the rain and cold, and while her young remain in it she guards them closely and does not hesitate to give her life in their defense. When danger threatens she carries the kittens to a place of safety, sometimes a long distance from the breeding den. The number of young in a litter is from two to seven, varying with the different species; lions rarely have more than two or three. The young of some species are born with their eyes open, while others have them closed about nine days.

But Where Did Cats Come From?

Scientists disagree on the question of the origin of the domestic cats. The earliest records on the subject are found in Egypt and indicate that the Egyptian cats were tamed 13 centuries before Christ. The Egyptian cat is still found in a wild state over a wide area in Africa, and its resemblance to the domestic cat is sufficiently close to suggest a common origin.

The ancient Egyptians regarded the cat with superstitious awe and treated it as a member of their families. When a cat died it was embalmed and buried like a human being, and the members of the family went into mourning. To kill a cat was a crime punishable by death. Mummified cats are often found among the ruins of ancient Egypt. The early Christians associated the cats with witches, and the devil was often depicted in the form of a black cat. Superstitions about cats survive among many peoples even in civilized countries.

As a companion of man the cat is almost as universal as the dog. It is an exceedingly pretty, cleanly, and graceful creature. It likes to be fondled, and with gentle treatment becomes greatly attached to its keeper, displaying its affection in many artful ways. The cat is far more intelligent than is generally believed. It undoubtedly has profited by its association with man, keeping also its keen wild instincts.

Different Types of Fancy Cats

Among the different types of domestic cats a few are deserving of special mention. The Siamese royal cat is the rarest and commands the highest price. Its face, legs, and tail are brown; its body is cream-colored, and its eyes are light blue. The Angora, or Persian, cat is distinguished by its large size, its long silky hair, and its flesh-colored lips and soles. The tortoise shell cat is very popular in Spain, and is especially noted for its intelligence. The Manx cat is the most ungainly-looking representative of the cat family.

Cats are very useful in destroying rats, mice, and other harmful rodents, but they have also won a bad reputation for killing birds.

Felis is the scientific name for cat. Domestic cat, *Felis domesticus;* Angora cat, *Felis domesticus angorensis;* Manx cat, *Felis domesticus ecaudatus.*

ARISTOCRATS OF THE WORLD OF CATS

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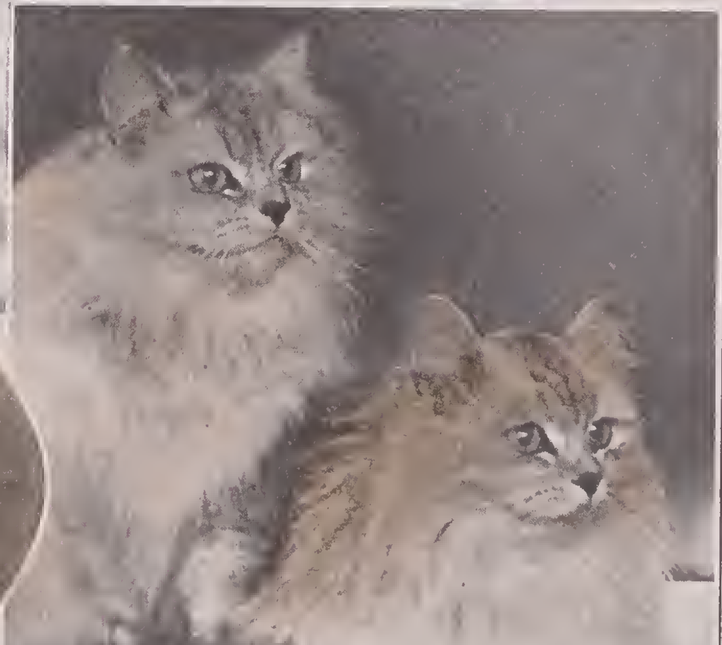
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Like so many other beautiful and luxurious things, the long-haired nobility of Catdom originated in Eastern countries. Persians they are, and silky lords and ladies of Angora. Many of them have pedigrees as long and imposing as any duke or earl. They seem to realize that they occupy a position far above the plebeian Toms and Tabbies that howl of nights on back fences and ash-heaps. For usually the aristocrats "toil not, neither do they spin, yet Solomon in all his glory was not arrayed"—in one-half so fine a coat. We have here a Silver (1), a Silver Black (2), a Smoke (3), a Blue Sapphire (4), a Dark Sapphire (5), and two Chinchillas (6).

CATAL'PA. There are eight or ten species of this flowering tree, two of which are found in the United States and the rest in eastern Asia. The common catalpa is a native of the southern United States and is cultivated as an ornamental tree in most of our northern cities. It is also grown extensively for fence posts and railroad ties, as it is quick-growing and is hardy and thrives in cultivation. The clustered flowers of this species are white, slightly tinged with purple and violet in the throat; the leaves are broad and vivid green in color, covering the tree with dense luxuriant foliage. The flowers are followed by pods, often a foot in length, called Indian cigars by the children. The tree seldom attains a height of more than 40 feet. The other American species is larger, sometimes reaching a height of 120 feet. It is a native of Illinois and the neighboring states and does not thrive in other localities.

Scientific name of common catalpa, *Catalpa catalpa*. Bark dark gray, broken into small flaky parts. Leaves simple, opposite, and broadly ovate, light green above, downy underneath. Flowers white, mottled with purple inside and spotted with yellow; growing in erect terminal panicles. Fruit, pods 6 to 12 inches long, containing winged seeds.

CATBIRD. The catbird is a "grand-stander." He sings best when he is sure that someone is listening, and he always poses on the most conspicuous twig in the garden. There he mimics the other birds with many musical flourishes, and cat-calls and tree-toad notes thrown in. His name comes from his success in imitating the plaintive mewing of a cat in distress.

The clever bird that can make a noise like a cat.

The catbird is about nine inches long. It is not showy with bright feathers, but no bird of the garden is clothed with more distinction. The whole family—father, mother, and children—have blue-gray feathers set off by a black cap and tail with just a touch of rust color underneath.

The large nest of twigs, dead leaves, and rootlets may be hidden in the shrubbery about the very door of the house, or in swampy thickets. There are four to six eggs of deep bluish-green color. Catbirds eat insects and fruit, sometimes the choice garden berries, but they prefer wild fruit if it is to be had. They are common throughout the greater part of temperate North America. They winter from the Southern States through Central America.

Catbirds belong to the family *Miminae* and are closely related to the mocking-birds. Scientific name, *Galeoscoptes carolinensis*.

CATERPILLARS. These little wriggling wormlike animals are part of the wonderful life history of moths and butterflies. Hatched from a tiny egg, they first appear as tiny creatures so small they can hardly be seen. But they have appetites all out of proportion to their size, and eat so prodigiously that they soon outgrow their original skins. Before they can grow further, they have to molt, that is, shed their skins; and with the outer skin they leave behind the lining of their stomach.

Then the caterpillar goes on eating until it again outgrows its skin, and keeps on repeating the process of molting until it is full grown. Its only business is to eat and molt, so the quantity of food it consumes is amazing. The so-called American silkworm, which feeds on oak and other leaves, in the 56 days of its life as a caterpillar eats leaves to the weight of 86,000 times its own weight when it is first hatched. Finally, after a month or two of life as a caterpillar, or even in some species from two to four years, these greedy little creatures, all plump and vigorous, are ready to make the cocoons in which they sleep as a pupa or chrysalis until they are ready to emerge for their few radiant days of life as moths or butterflies.

A "FRIGHTFUL" CATERPILLAR

The caterpillar of the Elephant Moth frightens enemies with those spots when he pulls himself together.

Just What is a Caterpillar?

Other insects undergo similar changes of form (called *metamorphosis*), but only the larvae or young of butterflies and moths are called caterpillars. Although caterpillars are soft-bodied and wormlike, yet they differ very much from the true worms such as the earthworm. All caterpillars have three pairs of jointed legs, as do all insects, situated on the three segments behind the head. They also have several pairs of jointless legs, rather stout and fleshy, upon the abdomen. These are called pro-legs, and the hind one a propleg; they disappear when the caterpillar transforms.

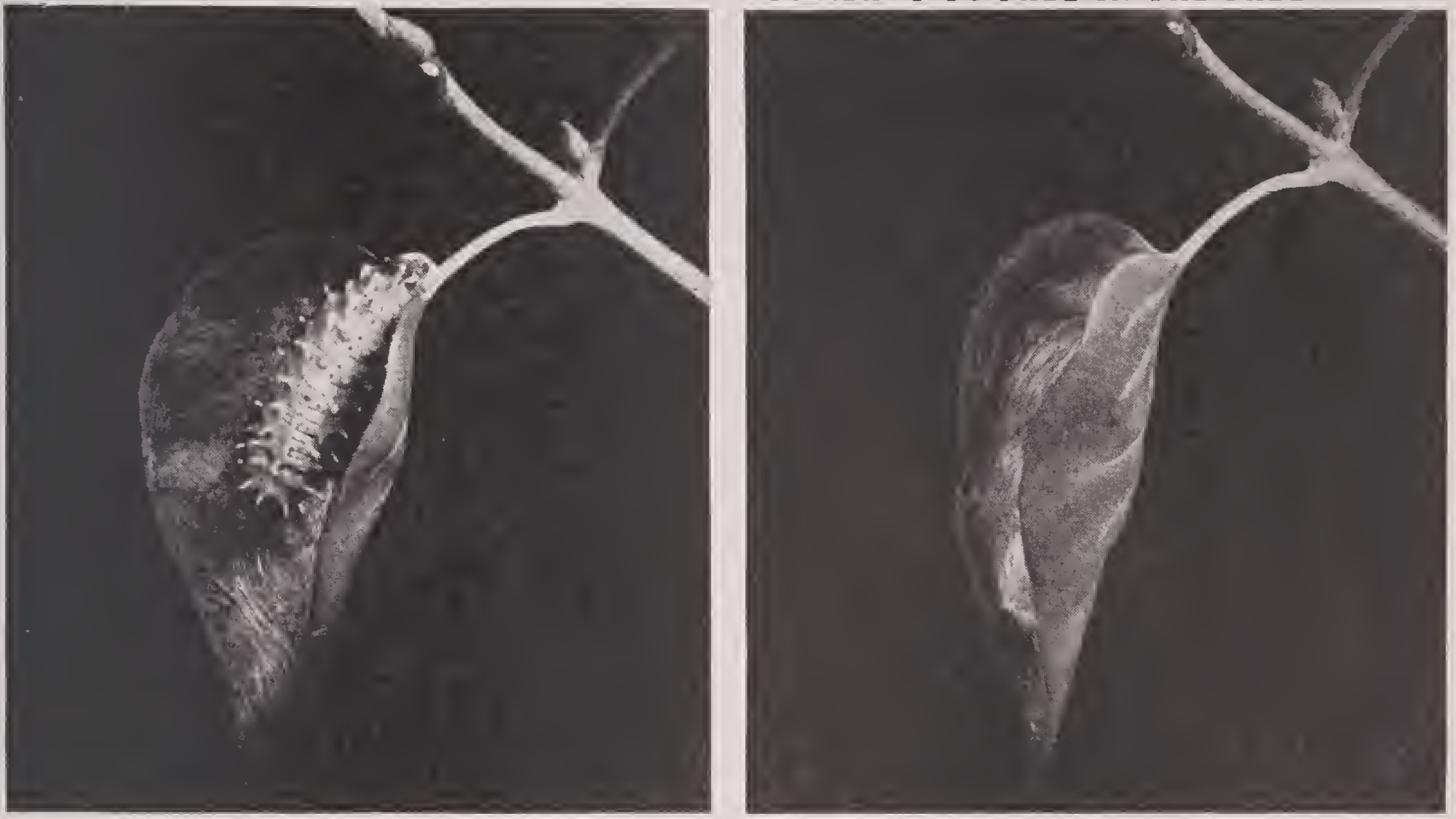
Caterpillars breathe by a system of air tubes, which open as little pores along the side of the body. These little air tubes, which branch again and again, and penetrate to

A QUEER WAY TO SLEEP!

The caterpillar of the Pasha Butterfly, with two tails, works at night and rests all day like this.

every part of the body, are called *tracheae*. This is the way in which all insects breathe.

HOW THE ARRINDI CATERPILLAR GETS READY TO FALL IN THE FALL



The Arrindi caterpillar fastens its cocoon in this way to insure its safety when the leaf falls in Autumn. Before wrapping itself in its own silk sleeping robe, it carefully weaves its threads all around the leaf stalk. When the cocoon is finished, the caterpillar has, in the words of Bryant's poem 'Thanatopsis', "wrapped the drapery of his couch about him," and when the leaf is finally carried to the ground by the autumn winds he, as we may imagine, "lies down to pleasant dreams."

Caterpillars vary greatly in size, form, and in body covering. Some are large and naked, and rather fierce looking (like the tomato worm), while still others are smaller and furry, like the common yellowish-brown "woolly bear" (the caterpillar of the tiger-moth). Many are very brilliantly colored.

Vegetable substances, such as green leaves or flowers, are their usual food; and in most cases each form prefers a certain kind of plant to feed upon, and will die unless they can find it. While many caterpillars are harmless, the tent-caterpillar and some others do very great damage to trees by stripping them of their leaves. Another caterpillar called the army-worm is very destructive to grain, while the cotton-worm injures the cotton plants. Scientists estimate that more than 30 million dollars' loss has been caused by the cotton-worm in the Southern States in a single year. Others, like the caterpillars of the clothes-moth and the carpet-moth, do enormous damage to textiles of nearly every sort—woolens, silks, etc.

Most butterfly pupae hang with their heads down, but the Pegasus Bird-wing prefers to sleep with his head up.

Moth caterpillars when ready to go into the pupal stage spin about themselves cocoons of silk which is produced from glands in the body and is spun out of an opening in the lower lip. This comes out as a sort of sticky fluid which hardens on exposure to the air. In the case of the silkworm this fiber is unraveled from the cocoon in long strands, which are twisted into threads to be used as silk thread or woven into cloth (*see* Silk).

Some caterpillars make for themselves a cocoon of leaves, closely bound together by silk, and others, like the tobacco-worm, simply crawl into a hole in the ground, or under a log or stone, or into a crack in a fence-post or tree-trunk for protection during their pupal sleep. The caterpillars of butterflies make no cocoons of silk, but suspend themselves by a button of silk and pass this stage as a naked pupa called a chrysalis.

During the pupal sleep the entire body of the caterpillar undergoes a change. All the tissues are broken down and then rebuilt in the form of a butterfly or moth. Finally the creature emerges, no longer a crawling caterpillar, but a splendid creature with broad delicate wings.

Birds and other animals are very fond of caterpillars and destroy hosts of them. As a rule birds do not like the hairy kinds, nor the kinds with large spines. Some kinds of caterpillars are also provided with glands which pour out a very bitter fluid, and of course these escape being eaten. The oriole and the yellow-billed and black-billed cuckoos, however, delight in the hairy caterpillars, and sometimes the latter eat so many of them that the insides of their stomachs become coated with hairs, as though they were lined with fur. (*See* Butterflies and Moths.)

CATFISH. A large-headed smooth-skinned food fish, with barbels about its mouth which resemble cat's whiskers, whence its name. "Bullhead" and "horned pout" are also names given these fresh-water fishes, some species of which sometimes grow to more than 100 pounds in weight. (*See* Fish.)

CATHEDRAL. Early in the Middle Ages when Latin was the only language used by educated people, the church which contained the official "seat" or throne (*cathedra*) of the bishop was known as the *ecclesia cathedralis* or "church of the seat." As time went on this term was shortened and today we call the church over which the bishop presided the "cathedral."

In those days everyone belonged to the Roman Catholic church and the whole community united in the effort to build a church which should not only glorify religion but which should also be a credit to the city. The bishop's church usually was the largest, finest, and most richly adorned church building in the diocese, or bishop's district. This is not always true, however. The Church of St. Peter's at Rome is the most glorious church building in Christendom, but the pope's "cathedral" is the older but less splendid church of St. John Lateran.

As a result of those efforts of medieval men we have today all over western Europe great gray stone cathedrals whose roofs and towers dominate the whole countryside. In the magnificent Gothic cathedrals of northern France, dating from the 12th to the 15th centuries, the tall pointed window openings are filled with pictures in stained glass, whose rich and varied colors add to the splendor of the interior. Everywhere, within and without, the sculptor's art has scattered figures of men, animals, and plants. Artists and sculptors have vied with one another in representing the history of humanity and of Christianity, and scenes from the Bible, figures of the saints, and representations of the Virtues and Vices "make up a kind of layman's Bible that appealed to the eye and was understood by all."

These memorials to the faith and spiritual aspirations of the Middle Ages were not built in a day. The construction of such cathedrals as Notre Dame of Paris, St. Mark's of Venice, and Canterbury in England was protracted through hundreds of years.

So well, however, were the great medieval cathedrals built that many of them still stand in Europe today, firm and secure. Others, such as the beautiful ones of Amiens, Reims, and Antwerp, were seriously damaged or reduced to heaps of ruins by the Germans during the World War of 1914–18.

St. Paul's in London is a later structure of the Church of England, dating from a period following the Reformation. Like St. Peter's in Rome, it is built in Renaissance style. America, too, has her cathedrals, of which Notre Dame of Montreal and St. Patrick's in New York City are among the most notable. They will probably be surpassed, however, by the Protestant Episcopal Cathedral of St. John the Divine, in New York City, which was begun in 1892 and will cost when finished more than $10,000,000. (*See* Architecture for illustrations of famous cathedrals.)

The Most USEFUL *of all* DOMESTIC ANIMALS

THE story of domestic cattle, beginning more than 5,000 years ago with rudely carved pictures on the ancient monuments of Egypt, runs through the history of practically every country and age to the present day. It is a record of faithful service, for cattle are the most useful of all domestic animals, providing man with milk, meat, leather, and other valuable commodities, as well as patiently lending him their vast strength to draw his carts and plows.

CATTLE. When cattle were first tamed no one can say. We know that early man found various types of oxen and bison roaming the wilds of Europe, Asia, and Africa, and that he killed these for food. A picture of one of these powerful shaggy bison of prehistoric times has been preserved for us in the cave of Altamira, Spain. Scholars believe this painting is at least 20,000 years old. It was probably thousands of years after this before men got the idea of taming wild cattle, to serve as his draft animals and as a permanent food supply; but this step had been taken by all the great peoples of antiquity before the beginning of recorded history.

The story of cattle in the Americas begins with the coming of the Europeans, for they did not exist in the New World before that event. Columbus on his second voyage brought cattle to the West India islands, and early settlers carried them to the mainland. Oxen toiled with the pioneer in clearing and breaking the farm land that was to be the foundation of the country's prosperity. Oxen drew the prairie schooners westward when western settlement began, and as late as the close of the Civil War there were over 2,000,000 working oxen in the United States. In Alaska today the ox is an indispensable aid to the settler, drawing the sledge, the cart, and the plow, as he still does in many other parts of the world.

How Men Developed Cattle

But with the advance of civilization, cattle became more important as producers of beef and milk; and then men learned that by careful selection, feeding, and breeding, they can wonderfully increase the amount of food each animal yields. The breeding of cattle is a fascinating story. Nature furnishes an infinite variety—no two animals exactly alike. By mating those which possess in highest degree the qualities desired, men have produced hundreds of races or breeds especially adapted to their needs.

Such scientific breeding has been practiced for less than two centuries. It originated in the effort to improve the "roast beef of old England," for the early breeders made their selections to secure an animal that would produce the greatest weight in the choicest cuts of meat and with the least weight in bone and waste portions.

The raising of cattle for the production of milk and dairy products is of comparatively recent origin and is distinctly an occupation of the highly civilized nations. Today the dairy cow ranks the highest of all animals as a producer of human food, and so can be kept with profit on even the most expensive of farm land.

Three Hundred Different Breeds

There are now over 300 breeds of cattle showing every variety of color from white to jet black, including grays, tans, and reds, with markings of every sort —piebald, mottled, spotted, flecked, and brindled; some hornless, and some with horns long or short, curved or straight. The favorite beef breeds are the Shorthorn, Hereford, Devon, and the three hornless breeds—the Aberdeen Angus, Galloway, and Red Polled cattle. Dairy animals form a most striking contrast to the beef type. Instead of the heavy, well-rounded body of the beef animal—sometimes weighing as much as 2,000 pounds—the dairy cow is lean and angular, being bred not to put on flesh but to produce the largest quantity of milk from a ration of feed, and to continue furnishing milk almost continuously throughout the year. A good dairy cow should average six or seven quarts of milk for 300 days in the year. and the best will yield ten to twelve times their own weight in milk every year. Cows which are of the beef type and also produce a fair quantity of milk belong to what are sometimes called "dual purpose" breeds. The milking Shorthorns are of this type.

Next to breeding, proper care and feeding are of the greatest importance in improving cattle. Both beef and milk production can be increased by kind treatment, comfortable quarters, and clean wholesome feed in proper quantities.

The feeding of many "scrub" cattle (cattle which have not been improved for any purpose) greatly reduces the profits from either beef or milk production. There are a number of pure-bred herds in the United States and Canada, pure-bred stock having been imported from Europe, but most of the herds are of the type known as "grades," cattle improved by mating with pure-bred animals.

A peculiar digestive system enables cattle to use coarse feeds called "roughage" which would not be suitable for feeding horses or other farm animals. The cow has a compound stomach of four compartments, which in large animals has a capacity of 60 gallons. The food goes into the large first stomach or pouch, where it is softened, and then overflows into the smaller second stomach. From either of these pouches the food may be returned to the mouth in small portions or "cuds" for rumination or "chewing the cud." That is why cattle are called "ruminants." The food is again swallowed and goes into the third, and then into the fourth or true stomach.

Cattle have no teeth at the end of the upper jaw, and in grazing the vegetation is pulled, rather than cut off, by the lower incisor teeth pressing on the tough pad of membrane covering the upper jaw. (*See also* Agriculture; Dairying; Meat Packing; Milk.)

Cattle, with buffaloes and bison, form the sub-family *Bovinae* of the family *Bovidae*, which includes sheep, goats, antelopes, the musk-ox, and many other varieties of hollow-horned ruminant mammals. Scientific name of European cattle, *Bos taurus;* of the zebu (the humped cattle of India and Africa), *Bos indicus.*

In earlier times the term cattle was applied to all kinds of live animals reared for human use, including swine, horses, sheep, goats, etc. The term "neat cattle" later came to be applied to the ox and cow to distinguish them from other domestic animals ("neat" being the Anglo-Saxon word for "useful"). The word "cattle" is the same in origin as "chattel" and "capital," reminding us of the patriarchal days when cattle were the most valued possessions and served as a measure for valuing other kinds of property.

CAU'CASUS MOUNTAINS. Since early history the region dominated by the Caucasus Mountains has been a land of poetry and romance. Here, according to Greek legend, was the mountain where the Titan Prometheus was punished for stealing fire from heaven. Here also was the valley of Colchis, the goal of the Argonauts in their search for the Golden Fleece.

The old myths are dead, but the passage of time has not destroyed the fascination of this land "where Europe and Asia meet." Its wild and picturesque scenery, its strange mixture of races, and its handsome warlike mountaineers arouse the interest and curiosity of the civilized world; while its fertile lands and rich mineral resources have inspired with envy numerous outside peoples and states who have fought to possess them.

The Caucasus range extends more than 700 miles from the Sea of Azof to the Caspian Sea, forming a great land barrier between southeastern Europe and Asia. It varies in width from 60 to 130 miles. The central part of the range is believed to have 20 summits higher than Mt. Blanc; these include Elbruz (18,470 feet), Dykhtau (17,054 feet), Koshtantau (16,881 feet), and Kazbek (16,546 feet).

The northern slopes of the Caucasus Mountains rise gently from low and marshy steppes, but on the south the descent to the plain is often extremely abrupt. In some places the side of the range is like a wall of stone, more than half a mile high. Forests of oak, birch, fir, ash, and beech cover the lower slopes of the range, while the summits are capped with snow and ice. In the central region there are 900 glaciers, many of which rival those of the Alps in size. There are rich deposits of copper, silver, iron, cobalt, sulphur, quicksilver, and manganese, which have only begun to be tapped. The oil wells in the Baku region are world famous.

There are a great number of peoples represented in Caucasia, as this region is called. The chief ones may be roughly grouped as Russians, Armenians, Tatars, Circassians, and Georgians. In the long struggles for independence of foreign rule, the Georgians and Circassians have been the most warlike and defiant. Russia finally conquered the country in 1864. In order to govern the territory south of the mountains the Russians were obliged to construct a great military road, connecting Stavropol and Tiflis by way of Kobi Pass and the deep chasm of the Davial Gorge.

WHAT NATURE CAN DO WITH DRIPPING WATER

What a task it would be for a human architect to decorate a hall of such glittering beauty! Yet Nature did it easily, using nothing but limestone and dripping water to hang those Stalactites from the ceiling and to build up those Stalagmites from the floor. This marvelous example of Nature's handiwork is to be found in a cave near Cheddar, in Somersetshire, England.

The men and women of the Caucasus Mountains are often remarkably handsome, and the Georgians and Circassians are noted for their personal courage and love of music. The Turks carried off many of their women to the harems of Constantinople. The name "Caucasian race" is sometimes given to the white division or branch of mankind, because these mountaineers were supposed to be its most perfect and typical representatives. The rugs of the Caucasus are as fine as any produced in the Orient.

Most of the commerce of this region passes through the seaports of Batum, Poti, and Novorossisk on the Black Sea, and Baku and Derbent on the Caspian. Batum and Baku are connected by a railroad, passing through Tiflis. From Tiflis another branch thrusts southward through Trans-Caucasia to Kars and Erivan.

Following the Russian revolution of 1917 and the defeat of Turkey and the Central Powers in the World War, the conquered and oppressed tribes regained their cherished independence. A number of petty republics were set up, of which the chief were North Caucasia, Georgia, Armenia, and Azerbaijan. (*See* Europe for map.)

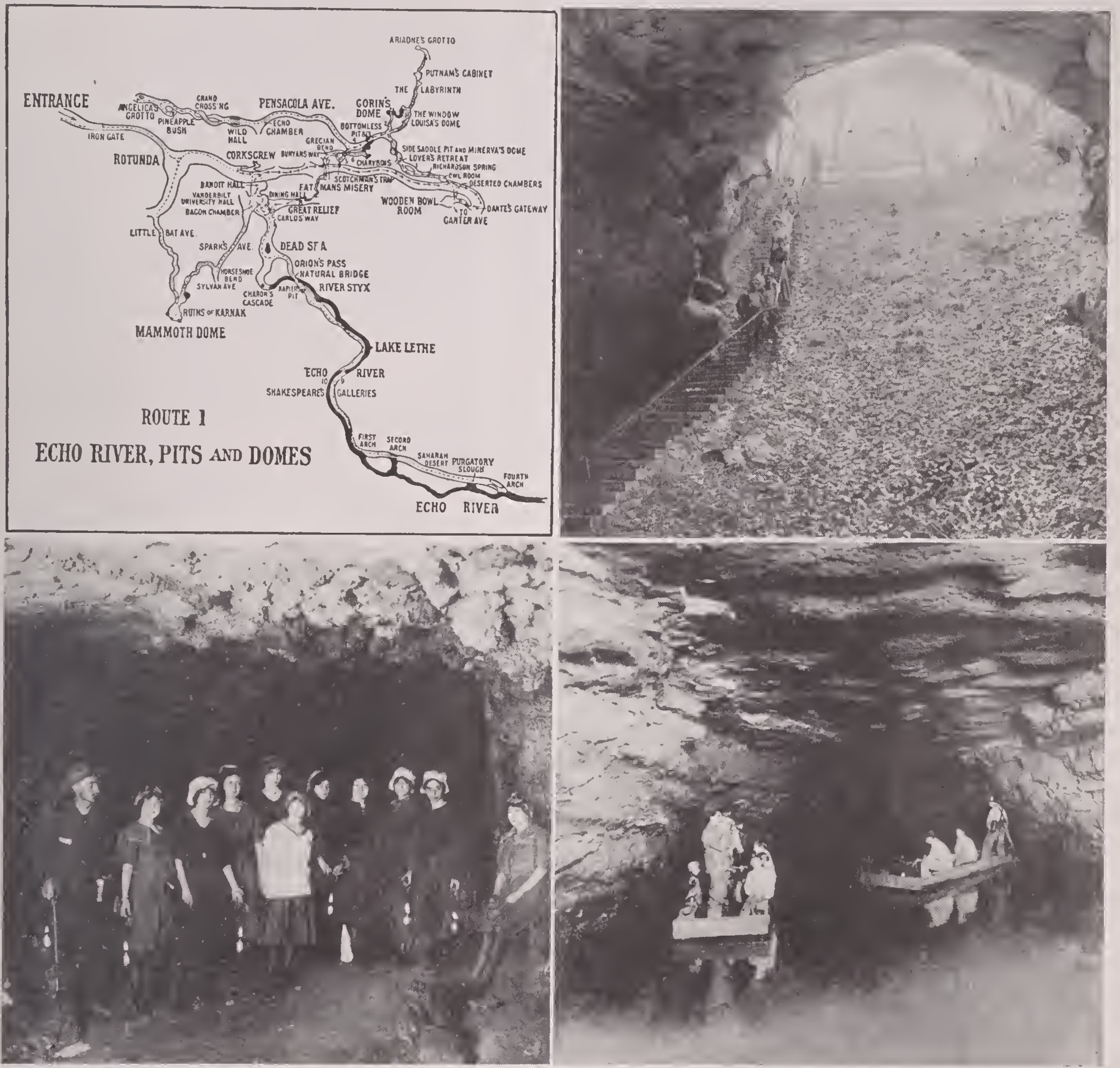
CAVE. Anyone who explores Mammoth Cave in Kentucky—the largest natural cave in the world—can easily understand why such great dark caverns in the earth have in all ages excited the awe and wonder of mankind. The rocky, arched walls of this abode of blackness rise in places 120 feet; and when the guide, holding a blazing torch above him, announces, "This is the Main Cave," his words echo and re-echo from the somber caverns in ghostly reverberations.

By the flickering torchlight one may explore the Rotunda, a mighty chamber one and one-half acres in extent; Audubon Avenue, an inky tunnel to whose walls bats cling in huge clusters; and then the Hall of Stalactites and Stalagmites.

Stalactites and Stalagmites

"Stalactites," the guide explains, "are these huge stony pendants hanging like icicles from the roof; stalagmites are similar forms rising in columns and cones from the floor. The water, seeping drop by drop through the limestone roof above you, falls and leaves behind particles of lime which it had in solution. Thus a stalactite begins to grow from the roof downward. The drops deposit more lime as they

VISITING THE WONDERS OF MAMMOTH CAVE



People who clamber through caves must dress for the part, as the bloomers and short skirts of the women in the lower left-hand picture testify. The woman at the right of this picture is sitting in the natural seat known as "Jenny Lind's armchair." The sightseers in the upper right-hand picture are entering Mammoth Cave, while the boats in the lower right-hand picture are floating on the underground Echo River. The map shows the most frequently visited portions of the cave.

splash on the floor, and so a stalagmite is formed. In some cases, stalactites and their stalagmites meet, forming massive pillars."

Soon the explorer comes to Echo River, one of several streams which flow through the cavern. As he paddles along in flat-bottomed boats, now and then he sees a pale-colored fish about four inches long dart through the water. It is a blind fish, one of many species of blind creatures, whose ancestors have existed so long in darkness that they have lost their eyesight. Among them are sightless beetles, spiders, crayfish, and salamanders.

One might wander about for days in Mammoth Cave, meeting wonders at every turn, for it extends for ten miles or so underground. It is made up of many passageways and chambers, whose total length would be many times ten miles.

After such a trip one can see why legends and superstitions have centered around caves in all ages, as in the Fairy, Dragon's, and Devil's caves of France and Germany, and the cave-palaces in the Harz Mountains, where the "Little Men" were supposed to have lived long after they forsook the forests and glens. Caves were the abode of the sibyls and nymphs in Roman mythology, and in Greece they were the temples of Zeus, Pan, Pluto, and Dionysus, as well as the seat of the Delphic and other famous oracles which attracted visitors from all the world.

More interesting than the legends, however, is the fact that from the remotest periods of history animals and men have inhabited caves, and from the remains they left men of science have been enabled to read the early chapters in the history of human and animal life. (*See* Cave Dwellers).

The Cave Dwellers of Today

Even today thousands of human beings live in caves in various parts of the Old World. In early times great numbers of tunnels and chambers were cut in the hillsides of England, Flanders, and France to serve as refuges for entire communities in time of invasion. Some of these are still so numerous as to form underground villages like the village of Troo, about 150 miles south of Paris, most of whose inhabitants still live wholly or in part underground. Some of these huge caverns in northern France were used as shelters for entire regiments during the World War of 1914-18. Other such rock villages have been found in Spain, Italy, Sicily, China, India, Egypt, and especially in Syria.

Caves always have been favorite haunts of smugglers, bandits, and other fugitives. They have even been used as tombs and places of worship. Many marvelous cave temples exist in India, and the rock-hewn tombs of Palestine and of Egypt, and the Catacombs of Rome probably owe their existence to the ancient practice of burial in hollows in rocks.

One of the grandest natural caverns is Fingal's Cave, on the island of Staffa on the west coast of Scotland, whose sides are formed of ranges of basaltic columns which are almost as regular as hewn stone. Among famous stalactitic caves are Madison's Cave, and Luray Cavern, in Virginia; Wyandotte Cave, in Indiana; and a number high above the sea in the Rock of Gibraltar, where remains of Neolithic cave dwellers have been found. Wind Cave in the Black Hills of South Dakota is noted for its size and beauty. In Iceland and Hawaii are many caves formed by the lava from volcanoes, and in France and Switzerland are huge ice caves. The Ozark region of Missouri is noted for its numerous caves, particularly Onandaga Cavern. The Cumberland Mountains in Tennessee contain some curious caverns, in one of which, at a depth of 400 feet, a river was found with a current sufficiently powerful to turn a mill. Another cave in the same state is named Big Bone Cave, from mastodon bones discovered there. Caves in northern California are also rich in animal remains.

Caves are principally met with in limestone and gypsum as the result of the solvent action of water. Lava caves appear to have been produced in many cases by the expansion of steam and gases. Sea waves sometimes hollow out caves in the cliffs along shores.

THE FIRST ARTISTS OF THE HUMAN RACE AT WORK

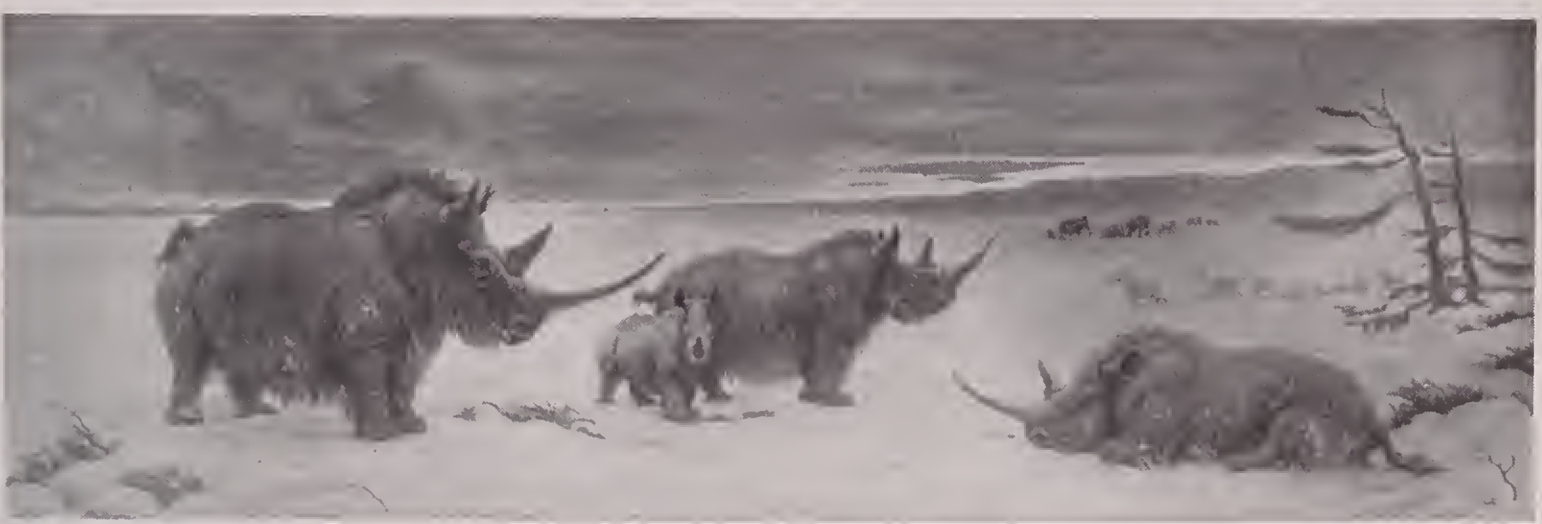
During the long winter evenings our Cavemen ancestors seem to have occupied themselves by drawing mammoths and reindeer on the walls of caves in which they lived. Many of these drawings are still preserved, and prove that these first artists of the race had a surprising amount of artistic ability.

CAVE DWELLERS. What sort of people were the ancient cave dwellers of the Old Stone Age who lived at the dawn of civilization in southwestern Europe? Scientists tell us that they were not only tall and strong with well-formed features, but that their skulls were larger than those of many savage tribes of today. This last is important, for we measure the intelligence of peoples roughly by the size of their brains. Probably these Stone Age men belonged to what scientists today call the Mediterranean race. (*See* Races of Mankind.)

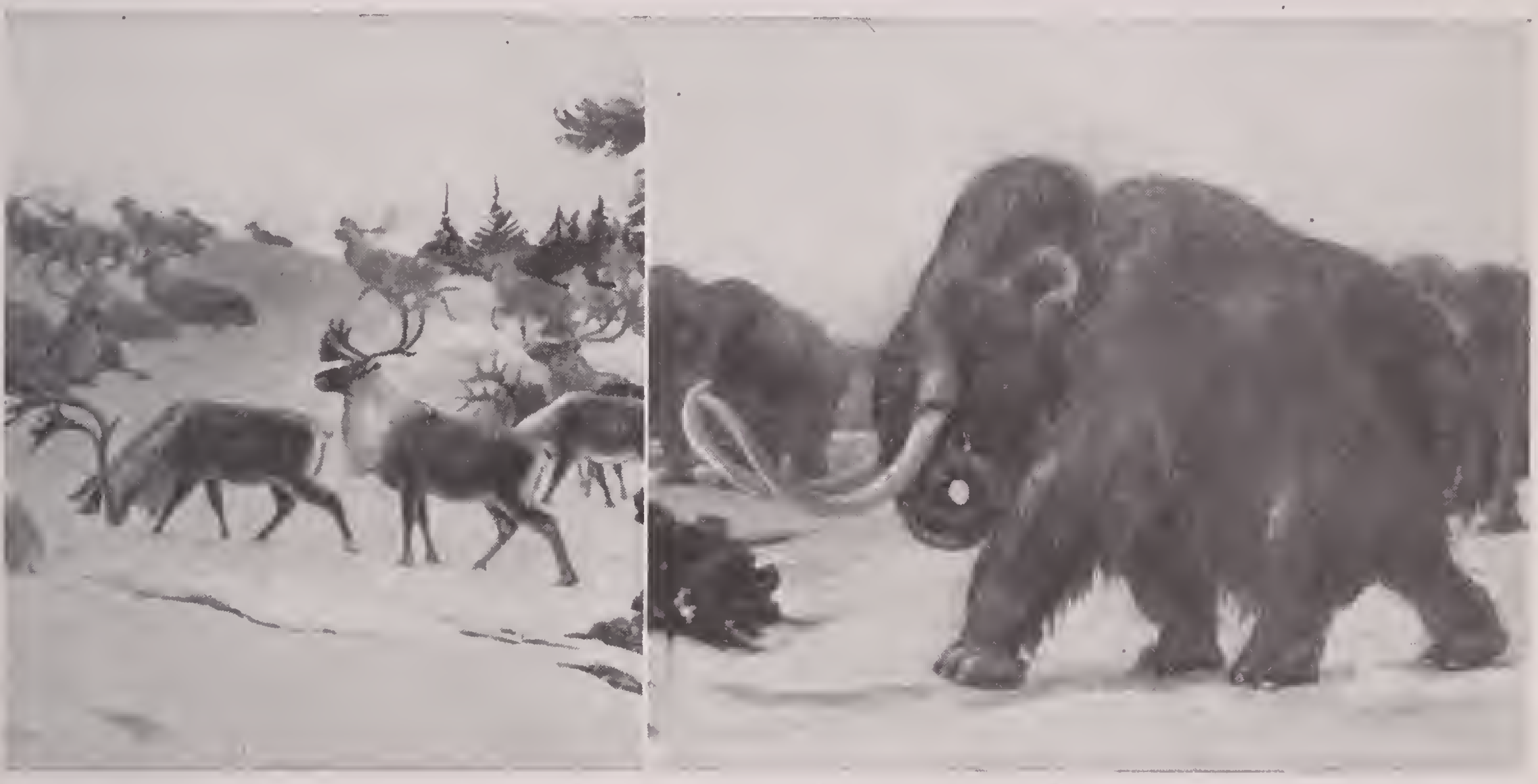
Because the first remains of these old cave dwellers were found at a spot called Cro-Magnon on the Vézère River in southern France, they are called the Cro-Magnon race, and the first skeleton discovered is known throughout the world as the "Old Man of Cro-Magnon." This old man was evidently one of the most intelligent men of his day. We are told that if he had had the advantages of modern education he might easily have been a scientist, statesman, or captain of industry.

But as it was, his manners were rough. Indeed, the skull of a woman found near his skeleton, and who

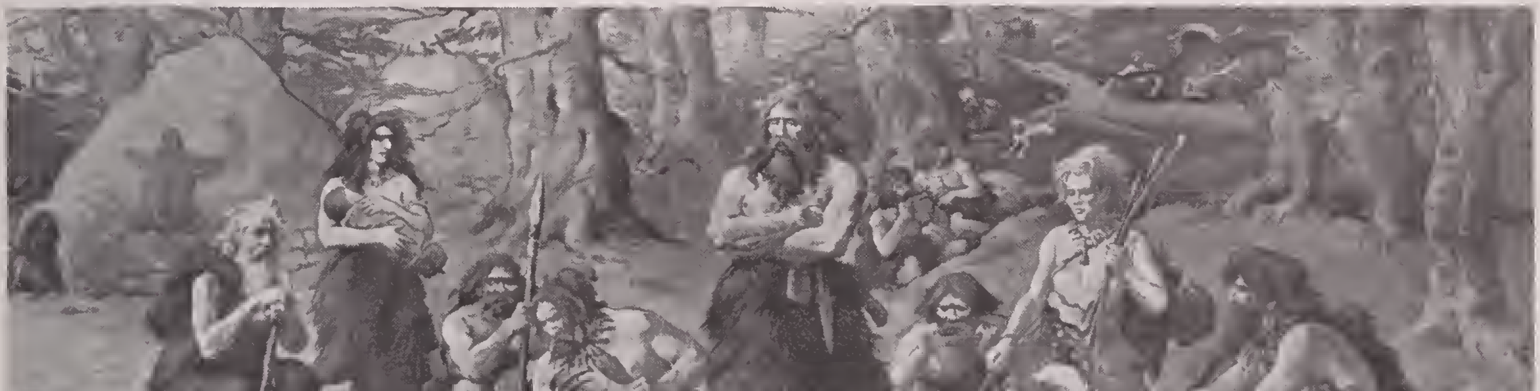
IN THE "WILD AND WOOLLY" DAYS OF LONG AGO



About the time our Cavemen ancestors were struggling to make both ends meet, the hairy Rhinoceros was roaming over the snow covered plains of Europe. A fierce and dangerous enemy he must have been with those two horns, the first one so long and sharp.



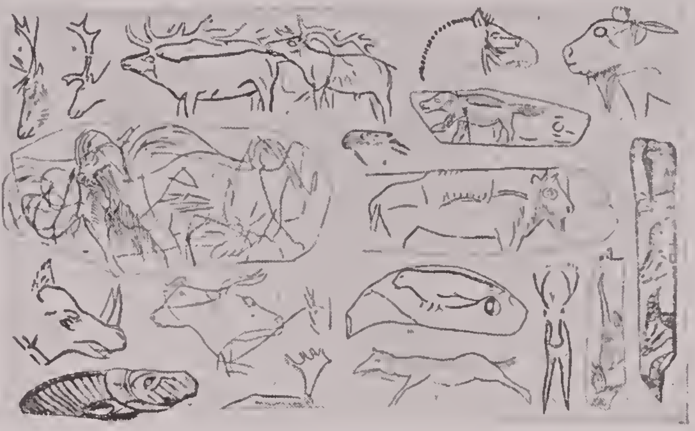
The great herds of Reindeer enjoyed the freezing climate which prevailed in those days, and the Cave Dwellers enjoyed the Reindeer, for these animals were their principal food. Occasionally, the hunters managed to trap and kill a Mammoth, and then everybody feasted.



The Cave Dwellers were followed by a people less artistic, but far more practical. These were the Neolithic tribes, who had tamed wild dogs, learned to make tents, and to polish the tips of their stone weapons. Here is a scene in one of their camps. All of these pictures are taken from the groups representing the "Age of Man" in the American Museum of Natural History.

is presumed to have been one of his wives, has a hole in it, evidently made by a blow from a flint hatchet. But women in those days were hardy, like the men, and the growth of the bone indicates that she recovered from this blow.

EXAMPLES OF THE CAVEMAN'S ART



These pictures were scratched on bits of ivory and bone by the artists of the Cro-Magnon period. They have a lifelike touch not found again in art until the Cretan and Grecian civilizations developed.

Such manners were natural in the midst of the hard life the cavemen led. They were surrounded by wild beasts, who threatened their lives every minute they were away from the shelter of their caves. While hunting the reindeer, the wild horse, and the bison, they were themselves hunted by the lion and the cave-bear, who then inhabited Europe. They were constantly running a race for their lives with an angry mammoth, a woolly rhinoceros, or a pack of fierce wild boars.

Yet these early men found time in the midst of their perils to draw excellent pictures, many of them very much better than most men can draw today. The walls of the old caves throughout France, Spain, and Italy are covered with finely carved and painted sketches of the animals the cave dwellers hunted.

How the Oldest "Old Masters" Worked in Their Caves

We may picture a Cro-Magnon artist at work on these walls in the long evenings. A friend holds a lamp, made of a bowl of rude clay filled with melted grease, in which floats a burning wick of plant fiber. While the wolves howl outside, the artist tries to remember just how that wounded bull looked when the spear struck him. When he has carved the outline in the rock, he fills it in with colors made of brown, yellow, red, or black earth, mixed with oil.

Near by sits a woman sewing skins with bone needles, while a baby sleeps on a bed of leaves in a corner. What would they think if they realized that 20,000 years later scientists would carefully copy the lines and colors of those first masterpieces and print them in thousands of books?

The Cro-Magnons were not the first cavemen. Thousands of years earlier, races even more savage, with sloping foreheads and monkey-like faces, occupied these same caves. And thousands of years later the peoples of the New Stone Age replaced the Cro-Magnons. Indeed, these caves are among the earliest books in which scientists read the history of man. They dig into the earth floor and there find the bones and stone weapons of one race, buried by the mud of ancient floods and the wash of sand and earth from the damp walls. They dig farther and find another layer of bones and weapons, telling of a still more ancient people. In these layers they find the remains of strange animals, long since disappeared. And out of all this the story of the cavemen is woven together bit by bit by the patient scientists who bring these wonderful relics to light.

The barbarian races who replaced the cave dwellers had no art, but had learned to tame the wild cattle and herd them with the aid of a wolf-like creature—"man's first friend," the dog. In time these peoples learned to practice agriculture and to use copper and tin. Still later they gathered into cities and built great buildings like the ancient pyramids of Egypt—which are not ancient at all if we compare them to the Old Man of Cro-Magnon, 20,000 years ago. (*See* Civilization; Stone Age.)

How Big-Head Slew the Cave-Bear

BIG–HEAD was very angry. While he was out hunting and the women and children were gathering berries and firewood, a huge cave-bear had seized the opportunity to take possession of the Big-Head family's cave.

The cave was on the banks of a small stream in southern France, and the time was some 20,000 years ago. It was a very different France, indeed, from the one we now know. Great Britain was still part of the continent, and the Arctic ice cap spread over all Europe as far as southern Germany, as it did over the whole of the Great Lakes region of North America.

But Big-Head didn't worry about the ice, and he had never heard of North America or even of Great Britain. His trouble was the bear. When news of their chief's misfortune was reported to the clan of cavemen it was decided that the bear must be driven from the cave at all costs. Nowhere else could Big-Head and his family find so comfortable a home, and winter was fast approaching.

Armed with their bone-tipped spears and flint hatchets, the cave dwellers gathered for the attack. They were tall strong men, with huge muscles and clad in skins which only partly covered their hairy bodies. But strong as they were, they couldn't face the bear in open battle. Big-Head, however, had a plan for ousting the intruder.

Strong-Arm, who could throw a wounded wild bull with his bare hands, was sent to roll a huge stone to the edge of the hill above the mouth of the cave. The other hunters were spread out among the rocks

For thousands of years it was nip and tuck whether man's primitive intelligence would make up for the fact that he was much weaker than his animal enemies. But when he learned to coöperate with his fellows and to use clubs and stones, he made the balance more even; and when he invented the stone dagger and the bow and arrow, he won beyond question the mastery over the brute world. In a way, Big-Head's struggle against the cave-bear was far more decisive than the battle of Waterloo, for it was the triumph of brains over brute strength.

near the entrance, each with spear set for a swift throw. Fleet-Foot, who had won many a race with young reindeer, was given a blazing pine torch. Urged on by Big-Head's rough voice, he crept near the black hole. With a sweep of his arm he threw the torch far into the cave and ran for his life.

A wild roar of fear and rage came out of the yawning cavern. There was a rush of a huge body to the entrance. Big-Head gave the sign, Strong-Arm's mighty muscles tightened, and the great rock tipped over the edge. As it crashed to earth it met the bear as he charged out to give battle, and crushed him.

That night there was a great feast on bear's meat. The cave dwellers painted their bodies with red and yellow clay and danced to the savage beat of a thigh-bone on a hollow log. The artist of the clan decided that when he recovered from the feast he would try to carve a cave-bear on a smooth bit of reindeer horn he had at home or perhaps paint a picture of the monster on the wall of the cave. Then they all fell asleep to the music of the hyenas snarling over the remains outside the cave entrance.

CAVOUR (*cä-voor'*), CAMILLO BENSO, COUNT DI (1810–1861). This great statesman, to whom more than to any other one person was due the uniting of Italy into a single kingdom, left a name, in the words of Lord Palmerston of England, "to point a moral and adorn a tale." The moral is that a man, by the force of patriotism and perseverance, can overcome seemingly insurmountable obstacles, while the tale is one of the most romantic of the 19th century.

Although a nobleman, Cavour had early developed liberal ideas. These were strengthened by frequent visits to London and Paris, where he studied the institutions which he wished to see introduced into his own country—the little kingdom of Sardinia-Piedmont in northern Italy. Cavour firmly believed that political liberty is impossible unless built upon industrial prosperity. His efforts, therefore, were early directed to improving agriculture and building railroads which, he said, "will stretch without interruption from the Alps to Sicily, and will wipe out all obstacles which separate the inhabitants of Italy and hinder them from forming a great and single nation."

The Italian peninsula was at that time divided into many small states all more or less under the dominion of Austria. Cavour believed that Austria could be expelled from these only by an established government which was recognized by the Powers of Europe. So as prime minister of Sardinia, the nucleus around which the present kingdom of Italy was to grow, he built up its strength in every way. Especially he sent troops to take part in the Crimean War, a step which was described as a "pistol shot in Austria's ear." (*See* Crimea.)

This policy eventually secured for him the friendship of Napoleon III of France, who pledged to aid Sardinia in case of war with Austria. In April 1859, the long awaited conflict began. But after three months of fighting, when victory seemed assured, Napoleon suddenly withdrew. The movement for the union of Italy had, however, gained too much momentum to be stopped. As a result of the war Sardinia had gained Lombardy. Then Garibaldi with the secret aid of Cavour conquered Naples (*see* Garibaldi, Guiseppi), and one portion of Italy after another joined the movement, until in February 1861 the struggle was over. In March Victor Emmanuel II was proclaimed king of Italy. The ambition of Cavour was at last crowned with success, after years of toil. Italy had ceased to be a mere "geographical expression," and had become a strong, united nation.

Cavour did not live, however, to enjoy his success, but died three months later, worn out before his time by his labors for his country.

THE AMERICAN "TREE OF LIFE"

The White Cedar or Arbor Vitae (Tree of Life) is not a true member of the cedar family. But the wood is valuable for building and manufacturing purposes.

CEDAR. The great durability and fine grain of the cedar tree, together with its surpassing beauty, has given to this conifer an important place. There are several species which thrive in northern Africa, Asia Minor, and the Himalayas; and though no true cedars are native to North America, some of the

African species have been introduced into the northern states and are highly valued as ornamental trees. The strong stately cedars of Mt. Lebanon, in Palestine, which for ages have been the theme of poets and artists, appear in the Scriptures as a symbol of power, prosperity, and long life. Though they grow to a considerable height their immense horizontal expanse is often greater than the height. The trunk, which is bare of limbs, is of enormous girth. The limbs, covered with dense dark foliage, rise tier upon tier, not unlike great black domes. These cedars (*Cedrus libani*) live for centuries, but they are gradually becoming extinct.

There are three species of conifers in North America which are mistakenly called cedars. These are the arbor vitae or white cedar, the Southern white cedar, and the juniper (*see* Juniper). Though they cannot compare with the true cedars in beauty or historical importance, their wood ranks high for building and manufacturing purposes.

CELEBES (*cĕl′ ē-bēz*). The interesting and picturesque island of Celebes is one of the largest in the group lying between Asia and Australia, known as the Malay Archipelago or the East Indies. To the west of it lies Borneo, to the east the Moluccas, and to the north, separated by the Celebes Sea, are the Philippine Islands. Celebes is of peculiar shape, consisting mainly of four peninsulas extending to the east and south; it has been compared to a starfish with rays torn off from one side. The area is about 72,000 square miles, somewhat greater than that of the state of Missouri.

The central and northern parts of the island are mountainous, and there are several active volcanoes. The scenery is varied and picturesque, and the vegetation is luxuriant. There are extensive forests of oak, teak, cedar, clove, and nutmeg trees, sago and other palms, pepper vines, sandalwood, mango, silk, cotton, and betel-nut trees. Though crossed by the Equator and lying entirely in the torrid zone, the climate of the island is more healthful than most tropical regions on account of the sea breezes. Among the chief products are coffee, sugar, spices, indigo, and tobacco. There are deposits of gold, copper, tin; some diamonds and other precious stones.

The island was first visited by the Portuguese in 1512, but has been in possession of the Dutch since 1660. The inhabitants, who are chiefly Malays, are a sturdy, industrious, and fairly intelligent people. They are largely ruled by native princes or *rajas*, and recognize the authority of the Dutch government. The capital is Macassar, in the southwestern peninsula. Population, about 2,000,000, of whom about 1,400 are Europeans.

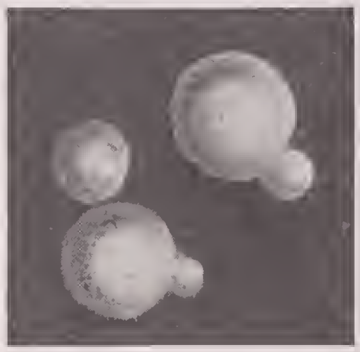
CELERY. Wholesome and delicate in flavor and handsome in appearance, it is difficult to believe that the crisp white stalks of celery served on our tables have been developed from a tough and woody weed. In its wild state no one would think of eating celery, for the sap is poisonous and bitter. Careful culture has, however, produced many edible varieties, some scarcely a foot high and others nearly three feet. One form, called "celeriac," is extensively grown in Europe for its turnip-like root.

"Blanching" or whitening of celery is effected by shielding the plants from the sun. The common method in most small gardens is to "bank" the plants by heaping the soil about the stalks or to place boards on each side of the rows. A new process consists of growing the plants so thickly that they protect themselves from the light.

Celery is a biennial, and is raised from seed, sown either in a hot-bed or in the open garden according to the season of the year; the second year the plants are set out in rows in the garden or field. The crop requires an abundance of moisture and fertilizer. Celery growing has become a great industry, the leading celery-producing states being New York, Michigan, California, and Florida. The stalks are either eaten raw as salad, or may be cooked. Celery seed is also used as an appetizing condiment. Celery (*Apium graveolens*) belongs, with parsley and carrots, to the natural order *Umbelliferae*.

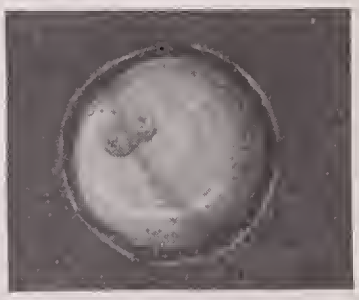
CELL. No romancer ever dreamed of a magician or a wizard who could do things half so marvelous as the tiny cell, that drop of the mysterious substance we call protoplasm which has built up your body and the body of every human being and every animal and every plant that ever lived. The cell is the "once upon a time" with which the story of life begins. Though it is usually so tiny that it cannot be seen without a powerful microscope, it has done more wonderful things than to turn pumpkins into gilded coaches and mice into horses. It didn't do them all at once, just by waving a wand. It began in a very humble way and took one small step at a time. At first it was contented to make another little round cell just like itself, then another and another and another, all as alike as so many peas. But each one of those cells full of protoplasm could eat and grow and make other little cells. Then by and by, after ages and ages, because they were alive and their home wasn't always the same, some of the cells changed a little, and they kept on changing every time they had to. And so by changing and developing these

BIRTH OF A NEW CELL



The parent cell is growing a bud or "spore." When this bud is sufficiently developed it will break off and become a new cell.

MULTIPLYING BY DIVIDING

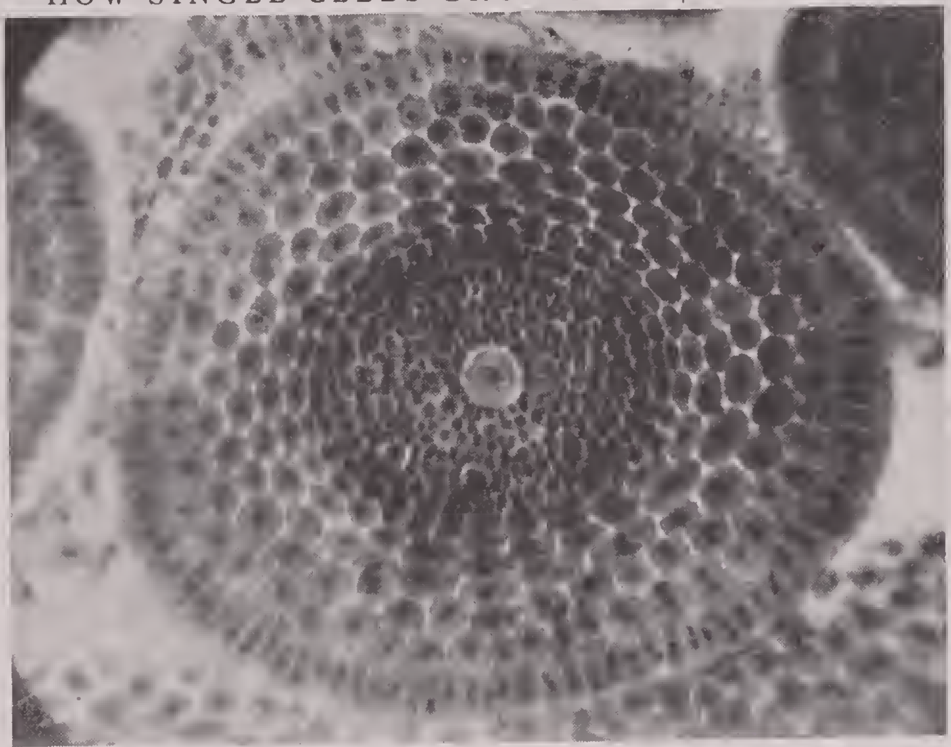


Here's another way new cells are made. The shadowy band shows where the parent cell is splitting in two. Each half will become a new cell.

cells have built up all the wonders of the living universe, from the tiny *amoeba* that consist of only one cell to creatures made up of millions upon millions of cells—the giant oak, the powerful elephant, and—most wonderful of all—man himself (*see* Protoplasm).

These cells might be thought of as tiny living bricks joined together to make up your body and the bodies of every living thing. Though a few kinds of cells are fairly large—unfertilized eggs, for example, are single cells—most of them are so small that it takes 200 of them to make a line an inch long. The cells that we know as bacteria are so tiny that it takes 25,000 of them to make an inch.

HOW SINGLE CELLS GROW INTO THOUSANDS



Twelve hours before this picture was taken this cross-section of a barley root consisted of only one central cell. That cell split in two, then each part split again, and within twelve hours the splitting process produced this complex array of cells. The laws which control this marvelous development are still only partly known.

Cells are of many different shapes. Some are globular, that is, like balls. Some are cubical, some long and slender, some thin, flat, and platelike. Bone cells are rounded, often with projections; the cells of the outer skin are thin and flat; muscle cells are long and cigar-shaped; while nerve cells may be very long and threadlike.

In spite of their great differences in form, however, all cells are composed of the soft jelly-like substance called *protoplasm*—the only form of matter in which life exists, and within which all the activities of life take place. Near the center of the cell is a small, denser, usually rounded mass of protoplasm called the *nucleus*, which seems to be the governing center. Sometimes there are two nuclei, one large and one small. Within the nucleus are many small rodlike particles called the "chromosomes." These are very important little particles, too, for it is believed that they carry the hereditary peculiarities from one generation to another. (*See* Biology; Heredity.)

How Cells Multiply by Division

Cells multiply by splitting in half. Each chromosome splits into two pieces, one of which goes into one of the new cells, the other into the other. These new cells in turn divide, forming four; these split into eight, then 16, then 32, and so on. This is how a plant or animal grows, and as you can see, the number of cells soon grows to be very great. As new cells form, old ones are constantly being pushed off. The flaky white substance which comes off our bodies in the bath is nothing more than a mass of dead outer skin cells, which are cast off to make room for the new ones growing underneath. Some cells live only a few hours; others may live for years.

Cells do many different kinds of work. In animal bodies, for example, some cells pour out a limy substance which hardens into bone, and thus the skeleton is built up. Still other cells mass themselves together and lengthen out to form masses of muscles to move these bones. Other cells grow very long and form nerves, while others grow thin and flat, and form a protective covering over the body, the skin. The cells of the stomach and intestines pour out digestive fluids, and the cells of the nose and throat produce mucus to keep those passages well moistened.

In plants, likewise, the cells are set apart for many diverse kinds of labor. Some form stems, others leaves, others blossoms, and all have their characteristic shape and produce their characteristic secretions (that is, substances they pour out).

If we look carefully at pond water through a powerful microscope, we can see many very tiny creatures swimming about that look like little balls, cigars, eggs, or stars. These are animals and plants which are composed of only one cell. Think of the difference between a whale on one hand, whose eye even is made up of millions of cells; and on the other hand, these little mites of beings whose whole body consists of but one! These one-celled forms are called unicellular organisms. In such free-swimming cells, the cell walls often grow out into the form of little hairs, which are used in swimming, or into little spines or whips or other projections. The amoeba, the lowest form of life that we know, has no projections and can even change the shape of the cell in any way it pleases (*see* Amoeba).

CELLULOID. One day in 1863, John Wesley Hyatt, a young printer in Albany, N.Y., wanted a little collodion to apply to a sore finger. He went to the cupboard and found that the bottle had tipped over and the collodion had run out and hardened on the shelf. As he picked off a bit of the tough elastic film, it struck him that here might be a substance which he could use to make composition billiard balls and so win a $10,000 prize which had been offered for such a discovery. For years he experimented, mixing various substances with the collodion to give it the necessary hardness. Finally he tried mixing camphor with collodion-cotton (pyroxylin) and putting the mixture in a hot press—and the problem was solved. When he opened the press he found a clear solid block of what he called "celluloid."

The process of making celluloid is essentially the same today. Collodion cotton, camphor, and alcohol are worked into a tough dough and then rolled into sheets or pressed into any desired form. Dyes and "fillers" may be added to give any desired color or quality. By varying the details of the process, slightly different plastic compounds are produced, known by a great variety of names such as fiberloid, viscoloid, xylonite, pyralin, etc. (*See* Cellulose; Collodion.)

This wonderful new substance is useful for hundreds of purposes. Edwin E. Slosson says in his 'Creative Chemistry': "It is hard but light, tough but elastic, easily made and tolerably cheap. Heated to the boiling point of water it becomes soft and flexible. It can be turned, carved, ground, polished, bent, pressed, stamped, molded, or blown. To make a block of any desired size, simply pile up the sheets and put them in a hot press. To get sheets of any desired thickness, simply shave them off the block. To make a tube of any desired size, shape, or thickness, squirt out the mixture through a ring-shaped hole or roll the sheets around a hot bar. Cut the tube into sections and you have rings to be shaped and stamped into box bodies or napkin rings. Ivory may be imitated by rolling together alternate white opaque and colorless translucent sheets."

Among the countless objects made of celluloid may be mentioned billiard balls, piano keys, and combs, handles for knives, brushes, mirrors, canes, and umbrellas; toys, cardcases, napkin rings, thimbles, hairpins, buttons, eyeglass and goggle frames, paper knives, eye-shades, bracelets, brooches, dolls, and photographic films.

The chief limitation to the use of celluloid is its inflammability. For this reason its manufacture and storage are regulated by law in most countries.

Modern chemistry has also given us a large number of other "synthetic plastics," that is, artificial substances which may be pressed, cut, or machined into any desired form. They are made in enormous quantities for phonograph records, telephones, and all sorts of electrical apparatus, for all have the quality of being non-conductors of electricity. One important group of these, called "condensation products," is made chiefly by the action of formaldehyde on carbolic acid and other coal-tar products. These are sold under various trade names, such as "bakelite," "redmanol," and "condensite" (*see* Coal-Tar Products; Formaldehyde). Somewhat similar compounds are also made by the action of formaldehyde on glue, skimmed milk, blood, casein, and other gelatinous and albuminous substances. These are extensively used in making soles for shoes, buttons, hairpins, phonograph records, and many other articles. In Japan the juice of the soy bean is treated with formalin to make a plastic said to be better than celluloid.

CELLULOSE. Every living plant in the world is constantly making that mysterious and complex substance called cellulose. They take water from the ground and carbon dioxide from the air and unite them into a substance closely akin to starch, containing carbon, hydrogen, and oxygen, which the chemist represents by the formula $C_6H_{10}O_5$. This is the stuff with which plants build up the walls of their innumerable tiny cells. Cellulose is, as a distinguished scientist has said, "the very temple of life." It makes up more than one-third of all the vegetable matter in the world.

With all his ingenuity, man has never been able to create a single particle of cellulose. But from the cellulose produced by the plants he has learned to make a thousand things indispensable to modern life. The paper on which these words are printed is nearly pure cellulose. So are the cotton and linen you wear, the jute used for sacks and linoleum, and the hemp, sisal, manila, and other fibers of which rope and twine are made.

More wonderful yet are the many new compounds that chemists have created from cellulose within the last few decades. Treat cellulose fiber in the form of cotton with nitric and sulphuric acids, and you get a violently explosive compound, guncotton (cellulose nitrate or nitrocellulose). If a less completely "nitrated" form of guncotton is prepared (usually called collodion-cotton or pyroxylin) and dissolved in a mixture of alcohol and ether, the resulting substance is the familiar collodion, which we spread over a cut finger to form a "new skin." Squirt collodion through tiny holes in a steel die, and it comes out as threads of silky fiber. This is one of the commonest ways of making artificial silk. Spread collodion over canvas or some other fabric and it dries in a tough film, making a good substitute for leather. Mix collodion-cotton with camphor and alcohol, put it in a hot press, and you get that most useful of artificial plastic substances, celluloid. By treating cellulose with acetic acid instead of nitric acid, cellulose acetate, a substance much like celluloid, is produced, which has the added advantage of being non-inflammable and hence is used in making motion picture films, windows in automobile curtains, and transparent coverings for index cards. Cellulose acetate is also the basis of one of the forms of artificial silk, and of an insulating and protective covering for electric wires. When cellulose is treated with an alkali and then exposed to the fumes of carbon disulphide, it goes into solution as cellulose xanthate. By further treatment this yields "viscose," which is used for making artificial silk and leather and for sizing, waterproofing, and textile printing.

CELTS (*kĕlts*). Long before the Christian era, while Rome was still a small struggling state, the whole of northwestern Europe was inhabited by a group of warlike tribes belonging to the great race called Celts. Their original home is unknown, but they may have come from the distant steppes beyond the Caspian

Sea. At the birth of the Roman republic, they had overrun and settled all the region north of the Alps and west of the Weser River, taking possession of the upper Danube valley, crossing the channel to settle Great Britain and Ireland, and penetrating into Spain.

The iron swords of the Celts carried terror even into Italy and Greece. In 390 B.C. the Celtic Gauls sacked Rome itself and long held the fertile valley of the River Po. Celtic bands from Thrace and Macedonia pillaged the shrine of the great oracle at Delphi in 279 B.C., and crossed over into Asia Minor, where they founded the kingdom of Galatia; it was to their descendants that St. Paul, three centuries later, addressed his Epistle to the Galatians.

Now turn the pages of history forward a thousand years. What has become of the once powerful Celts? They have virtually disappeared as an independent people. Cisalpine Gaul (in Italy) was conquered by Rome (222 B.C.), Julius Caesar had led his legions over the Alps, the short sword and spear of the legionaries had beaten down the long sword of the Gallic warriors, and the whole of Gaul had become a Roman province (58-51 B.C.). Four centuries later the German tribes from beyond the Elbe had pushed westward, the Celts had been driven out of the Rhine valley, and the Franks had conquered—but not Germanized—the Gallo-Romans. At an earlier date the Carthaginians had overpowered the Celts in Spain. Across the English Channel the Celtic Britons had been enslaved or driven into the remoter parts of the British Isles by the Anglo-Saxon invaders (5th to 7th centuries, A.D.).

Only on the fringes of Europe did the Celts manage to maintain their racial traits and their language—in Brittany, in Wales, in the highlands of Scotland, in the Isle of Man, and in Ireland. Everywhere else their individuality was lost or merged in that of their conquerors. The very qualities which lend such charm to Celtic literature—intense poetical imagination, romantic fervor, rapid change of mood—made the Celtic peoples less fit to cope with the ruder but more practical and more resolute peoples that overwhelmed them and drove them irresistibly back toward the Atlantic.

It is chiefly in the above-named regions today that we find such traces of the Celtic peoples as have survived—especially the Erse, Manx, Gaelic, Welsh, and Breton languages, and the Celtic folklore. Some few words in English, French, and other modern languages show Celtic origin, and it is possible to trace in modern peoples some of the physical characteristics of these once powerful tribes.

The name "Celtic Renaissance" (rebirth) has been given to the revival of interest, in the past 60 or 70 years, in the languages, literatures, and history of these peoples. The movement has been especially strong in Ireland, where it has led to a revival of lace-making and other art industries, and the writing and performance of plays with Celtic-Irish themes, as well as a movement for political independence. The study of Celtic languages and literatures is now a part of the work of most great universities of Europe and America.

The priestly class of the ancient Celts were called "Druids," and their religion is known as Druidism. Little is known of the Druids, because they did not allow any of their lore to be written out but transmitted it all by word of mouth. Caesar records that they were judges as well as priests. They held the oak and the mistletoe as especially sacred and usually performed their mysterious rites in the depths of oak forests. The many ancient stone monuments and circles scattered over the lands they inhabited were formerly ascribed to the Druids, but scientists now believe that these remains date back to pre-Celtic times.

CEMENT. Broadly speaking, cement is a term which may be applied to any substance used for making bodies adhere to each other. By far the most important class of cements is the hydraulic cements, which have the property, when they are mixed with water, of "setting" and finally becoming hard, even under water.

Three kinds of hydraulic cement are produced in the United States—portland cement, natural cement, and puzzolan, or slag cement; but the combined output of natural and puzzolan cement is now less than one per cent of the total production.

It was only about 50 years ago that the manufacture of cement was taken up at all in the United States. Before that time all portland cement was imported from Europe. Up to 1900 natural cement was the chief kind manufactured and in 1905 only 1,000,000 barrels of portland cement were manufactured. Now the yearly output is a hundred times that amount.

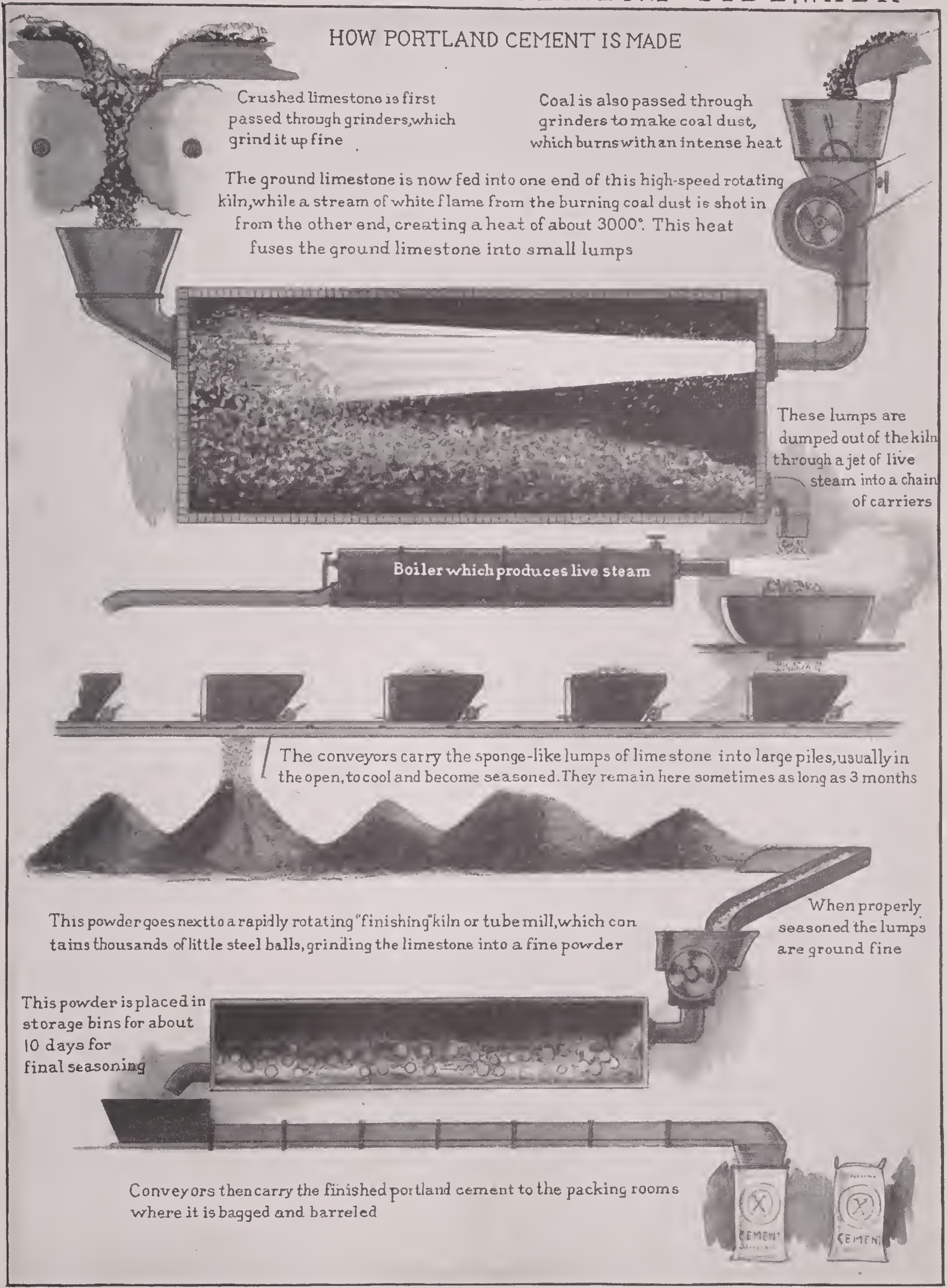
Cement-Making Old as Egypt

Nearly 4,000 years ago the Egyptians made a concrete that has stood the ravages of the centuries as if it were granite. The Greeks employed it to a limited extent, and the Romans made walls, aqueducts, roads, and monuments of it, which still stand. The Roman cement was made from lime mixed with finely ground volcanic ash. Mixing and grinding suitable blast-furnace slag with burnt slaked lime gives the puzzolan cement of today, which is similar.

In 1824 portland cement was invented in England. This is a compound of lime, silica, and alumina produced by grinding and mixing together some form of carbonate of lime with exactly the correct proportion of clay, burning the mixture at a high heat, and grinding the resulting clinker to a powder. It was named portland cement because of its strong resemblance in color, hardness, and strength to the limestone quarried at Portland, England. The raw materials commonly used are limestone, chalk, or marl, mixed with clay limestone or clay shale.

If a bed of limestone of uniform composition could be found containing exactly the right amount of clay, portland cement could be made by merely grinding and burning. But if there is the least variation from the correct proportions, the value of the cement will

EARLY HISTORY OF A CEMENT SIDEWALK



HOW PORTLAND CEMENT IS MADE

Crushed limestone is first passed through grinders, which grind it up fine

Coal is also passed through grinders to make coal dust, which burns with an intense heat

The ground limestone is now fed into one end of this high-speed rotating kiln, while a stream of white flame from the burning coal dust is shot in from the other end, creating a heat of about 3000°. This heat fuses the ground limestone into small lumps

These lumps are dumped out of the kiln through a jet of live steam into a chain of carriers

Boiler which produces live steam

The conveyors carry the sponge-like lumps of limestone into large piles, usually in the open, to cool and become seasoned. They remain here sometimes as long as 3 months

When properly seasoned the lumps are ground fine

This powder goes next to a rapidly rotating "finishing" kiln or tube mill, which contains thousands of little steel balls, grinding the limestone into a fine powder

This powder is placed in storage bins for about 10 days for final seasoning

Conveyors then carry the finished portland cement to the packing rooms where it is bagged and barreled

All the processes of cement-making are shown here in their proper order, from crushing the stone to bagging the finished product ready to be turned into walls, dams, reservoirs, sidewalks, and the like.

be greatly reduced. Most of the clay-bearing limestones of the United States contain too much clay and some magnesia. If this rock is burned at the high temperature necessary for portland cement, it fuses to a useless slag. But if it is burned at a lower heat, it yields a soft yellow clinker. When this is ground it gives the so-called natural rock cement, manufactured at Milwaukee, Wis., Akron, Ohio, and Louisville, Ky. This lacks the great tensile strength of portland cement, and is used for reservoir linings and other purposes where such strength is not needed.

Nearly every state in the Union has the raw materials for making portland cement, and so the manufacture is widely distributed. In the Lehigh Valley in Pennsylvania where the best materials are found and where 30 per cent of the cement produced in the country is manufactured, there is an unlimited deposit of slatelike limestone containing rather more clay than is required. To this a small amount of pure limestone is added. In England a comparatively soft chalk is generally used, and in Germany chalk limestone and mergel (limestone clay). In New York, Ohio, and Michigan there are deposits similar to chalk. Through Indiana, Ohio, and Illinois are deposits of cement rock mixed with carbonate of lime.

The manufacture of cement is an interesting process. In the dry process the raw materials are first crushed into fragments. This crushed rock is passed on into huge grinders carrying flails of steel, flying around at high speed. Here it is powdered until it looks like a dark gray flour. In other crushers and grinders coal is crushed and powdered.

Then comes the important part of the process. This takes place in enormous rotary kilns—lined with firebrick—so large that a horse could walk through them, and from 60 to 220 feet long. These kilns are mounted on pivots and turned over and over at a great speed by cog gears. Into one end a torrent of rock dust is forced, and from the other end the burning coal dust comes in a great stream of white flame to meet it. In this intense heat the powdered rock melts and fuses into little pebbles as small as a pea or as large as a hazelnut. The glowing red pebbles fall on an endless bucket belt and are carried away to the cooling towers, where forced draughts of cold air blow upon them. This cement clinker then goes to another set of grinders which reduces it again to flour-like dust, which is the portland cement of commerce.

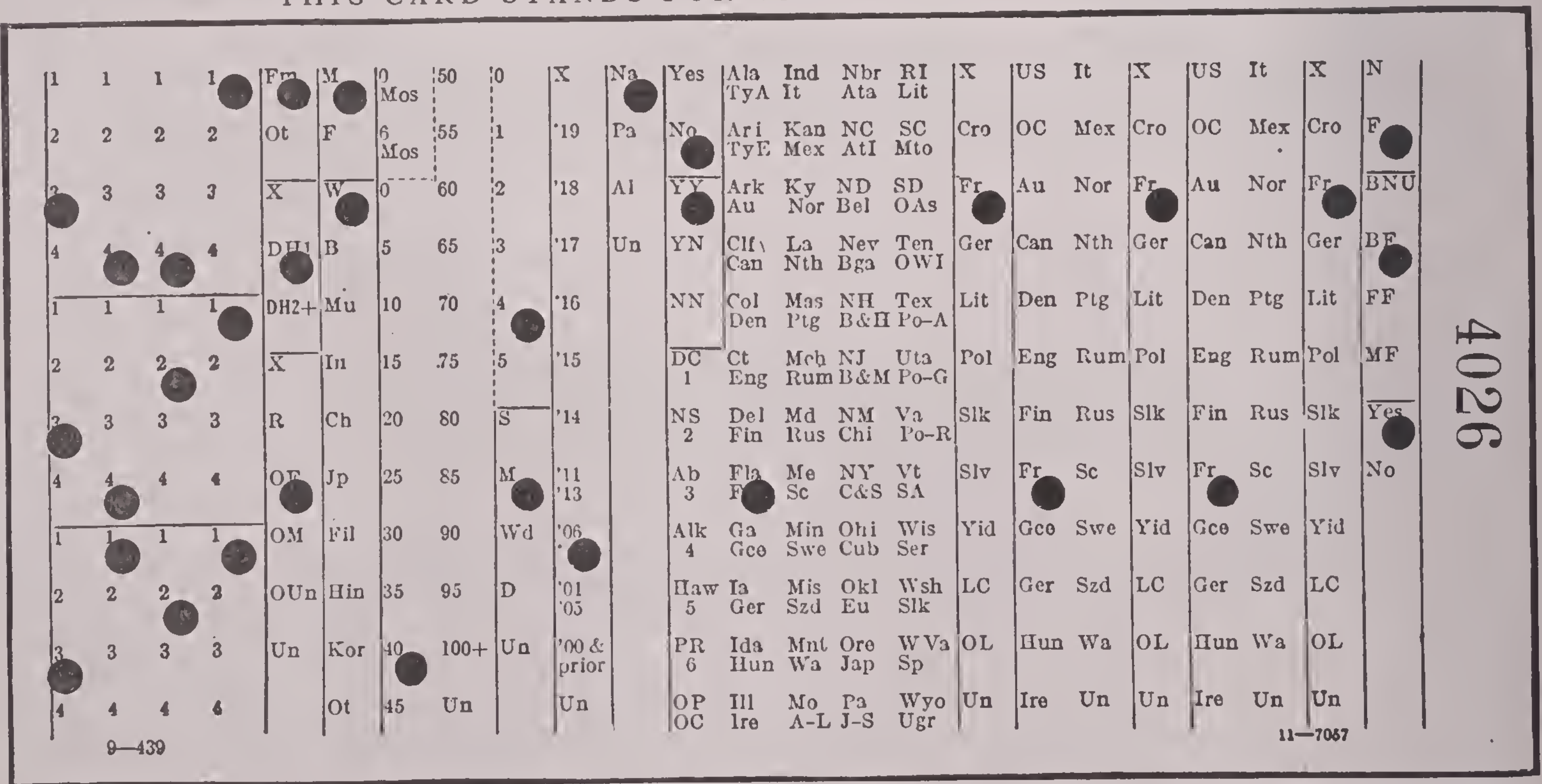
When the raw materials are not found in proper proportion, they are first ground wet, with the necessary ingredients added to make the proportions correct. The mixture may be formed into bricks, which are then crushed and treated as described, or the wet "slurry" may be pumped directly into the kilns.

Pure white cement is made by using carefully selected white sand, white quartz, and white marble limestone. By adding small amounts of pigments many brilliant and lasting colors may be obtained. (*See* Building Construction; Concrete.)

CENSUS. Every ten years a census taker comes to your house and asks a lot of questions—how many people live there, their ages, relation to each other, and so on. You know then that Uncle Sam is busy again "taking stock."

But how does Uncle Sam put together the millions of answers gathered throughout the country into the

THIS CARD STANDS FOR ONE MAN IN THE CENSUS



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If all the information gathered for the census were studied out from written reports, the work would be endless. Instead the desired information is punched on cards, one card for each man, woman, and child in the United States, and the cards are then run through machines which tabulate the data. This card carries the information about one man. As an example of how it works, the fact that this man is married is shown by the punch-mark near "M" in the fifth division from the left.

For any subject not found in its alphabetical place see information

few neat volumes which tell about the nation's industries and population? This is done in the Census Bureau building in Washington, where all the reports are sent. In this building wonderful fortune-telling machines do the work.

PUNCHING THE CARDS

This girl is reading the census returns and, with the aid of the machine, is punching the information they contain upon the card records.

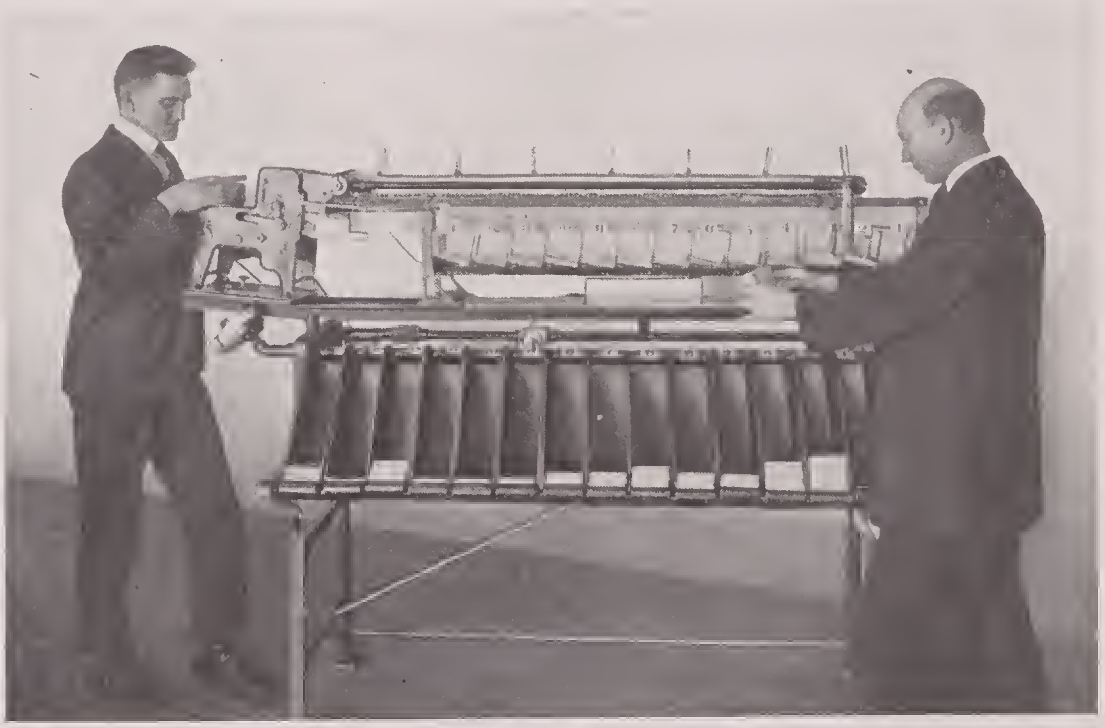
Ask a question, give the fortune-teller time to run through a tremendous pack of cards, at the rate of 400 a minute, and up will come the answer. These answers are enormously important, for they help Uncle Sam to see into the future, so that he can know what he ought to do. He may learn that the population is growing very fast but that the number of farmers is decreasing. Then he knows that the farmer must be encouraged, or sometime in the future the nation's storehouse of foods will not be properly filled. Perhaps he learns that his people are spending faster than they are saving. Then he begins to plan savings banks and other measures to encourage saving. How many people are there who cannot read or write? How many are unemployed? What work can they do? How many are delinquent or dependent because they are deaf, blind, or insane? What is the proportion of Indians, negroes, Eskimos, Filipinos, foreign-born Europeans, and native-born citizens in Uncle Sam's territory? The answers to these and many other questions show the weakness or strength of the nation, and guide law-makers, farmers, and business men in planning improvements.

To answer all these questions, these wonderful machines have to have more than a hundred million cards—a card for every man, woman, and child in the United States, making a stack ten miles high. The information contained on these cards has to be collected by a great army of workers—nearly 100,000 of them—who once every ten years go from house to house in every part of Uncle Sam's domain, visiting mansion and hovel, traveling on Eskimo dog trains through the severe cold of Alaska, and by native boat and primitive cart in the tropical lands of Porto Rico, Hawaii, and the Philippines. Each census-taker collects all the desired facts about every person in his district—name, address, age, color, occupation, property, whether he can speak English, and read and write, and many other facts.

"Wrong!" Says the Machine and Out Goes the Card

In the Census Bureau at Washington this information is compiled and classified by electrically operated machines, which seem almost human in their work. One machine punches holes in cards, the holes showing by their position all the information collected about the person to whom the card is devoted. Another sorts them by sex, age, occupation, etc., and then the tabulating machine gives the totals. No mistake is possible, for if an insufficiently punched card is put in, the alert machine stops until the offending card is taken out. This ingenious mechanism saves nine-tenths of the time and two-thirds of the cost of hand work, it is estimated, besides being more accurate.

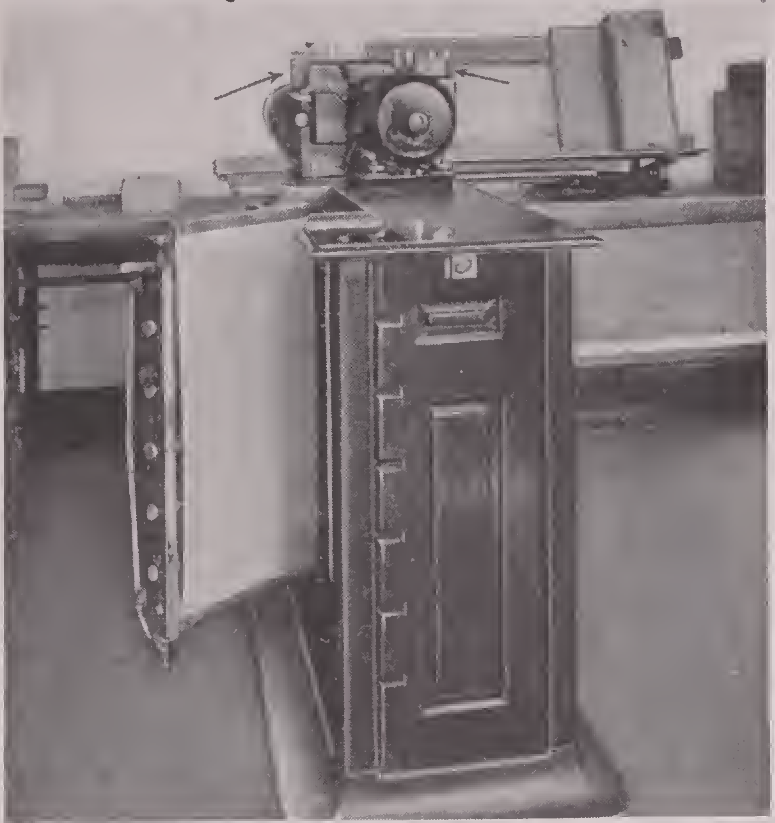
THE MACHINE THAT SORTS THE CARDS



This machine sorts the punched cards according to any classification desired and feeds them into the numbered slots. The machine will sort for country of birth, age, or any similar classification. When a slot is filled its contents are transferred to the corresponding vertical tray at the bottom of the machine, and by counting the number of cards in each tray, the total number of people in each group is determined. The machine handles 400 cards a minute.

The recent census reports have been published in more than 10 large volumes, of which about half deal with population statistics; the others give detailed information regarding agriculture and manufactures.

YOU ASK THE QUESTIONS, THE MACHINE ANSWERS!



After sorting the cards into groups, the census-takers want to know a lot of facts about each group. For instance, they may want to know how many people in the Italian immigrant group own farms. To learn this, they put the cards for this group into the machine shown above—the tabulator—and let it do the work. Contact points pass an electric current through each hole in every card that passes, and every current advances its particular counting device by one. The counting device for "Speaks English," for instance, will show how many cards bore this punch-mark. Since the machine has sixty counters, any set of cards can be checked for sixty facts at once.

A statistical atlas containing maps and charts which present this information graphically for all parts of the country usually accompanies the report. Think of the difference between this and the first census, taken in 1790, which was printed in a slender book of 56 pages!

Besides the main census report, the bureau also gathers statistics at regular intervals about wealth, debt, and taxation; religious bodies; water transportation, electrical industries; mortality and births; as well as many other subjects. Scores of special reports are also issued on such subjects as occupations, racial classes of population, population of metropolitan districts, etc.

How Uncle Sam Led in Census Taking

The United States was the first modern nation to adopt a legal or constitutional provision for the regular taking of the census. The constitution, which went into effect in 1789, requires that a census be taken every 10 years, because each state's representation in the House of Representatives is based on its population. Even in ancient times, however, censuses were occasionally taken. Ancient China took censuses to determine the revenues and the military strength of the different provinces. The Bible mentions the numbering of the tribes of Israel. Rome regularly took a census of population and property values every five years, and this practice gave us our "census," which is the Latin word for estimating or assessing. In the Middle Ages attempts to take a census were rare. The most famous is the census of England taken by order of William the Conqueror and recorded in the "Domesday Book."

These early censuses were highly unpopular because they were used as guides in exacting taxes and military service from the people. And even today many people make the work of the census-taker difficult because they do not understand the useful purpose of the modern census, and do not know that all information given is kept strictly confidential.

In addition to the United States census, many of the separate states take censuses at five- or ten-year intervals. All progressive countries also collect statistics similar to those of the United States census.

CENTAURS (*sĕn'tạrs*). The Greek legends are full of tales of the fabled monsters called Centaurs, whom they pictured as men to the waist, but with the lower part of the body that of the horse. At the feast celebrating the marriage of the king of the Lapithae, they made an attempt to carry off the bride. A fierce battle ensued between the Lapithae and the Centaurs, but through the assistance of Theseus, the friend of the king, the latter were defeated and the bride rescued. This battle inspired some of the sculptures of the famous Parthenon at Athens.

A CENTAUR FAMILY AT PLAY

Perhaps you have heard it said of a good horseman that he "rides like a Centaur." The simile refers to those weird mythical creatures—half man, half horse—about whom the Greeks wove so many thrilling stories.

Very different from most of the Centaurs was Chiron, noted for his learning and wisdom, and said to have been instructed by the god Apollo. To this wise Centaur Apollo intrusted the charge of his own son Aesculapius, who became the patron of physicians. Many other famous heroes were Chiron's pupils, notably Jason, Hercules, and Achilles.

CEN'TIPEDES. These "hundred-legged" creatures —for that is what the name means—are found in greatest numbers in warm countries. A few species only live in the United States. These are rather small, the largest one being about five inches in length, and they perform a useful service in eating worms and insects harmful to vegetation.

The larger centipedes live in the West Indies and in South America. Some of the biggest measure 18 inches in length. These are very ferocious creatures, living on insects, small animals, and birds, which they capture by means of their poisonous jaws. Their bite is fatal to many animals and dangerous to man.

Centipedes look something like worms, but a careful examination will show that they are very nearly related to the insects, belonging to the myriapod class (*see* Insects). Their bodies are long and are marked off into a great number of divisions called segments. They have as many pairs of legs as there are segments in the body, usually about 23, though this number varies somewhat with different species. The first pair of legs, fused at the base, form the poison fangs. The long feelers or antennae on the head, which are constantly waving about, take the place of eyes. Scientific name of American centipede, *Lithobius americanus*. The great tropical species is called *Scolopendra gigantea*.

CENTRAL AMERICA. Extending southeast from Mexico to Colombia, like the curved finger-tip of a hand whose thumb is Florida, Central America joins North and South America, partly enclosing the Gulf of Mexico and the Caribbean Sea. In this strip of land, nearly 1,000 miles long and varying from about 50 to 600 miles in breadth, are the six republics of Guatemala, Salvador, Nicaragua, Honduras, Costa Rica, and Panama, which, with the colony of British Honduras, comprise Central America. Broad lowlands of intense humidity and suffocating temperature occupy the wide Atlantic coast, covered with tropical forests except where banana growing has been introduced. Farther inland extends a range of mountains, growing higher and higher toward the Pacific until it culminates in the long and almost unbroken line of beautiful volcanic cones near the western shore. It is here, where the lava has created a marvelously fertile soil and where the heat owing to the high altitude is less intense, that civilization has mainly developed, and the chief staple, coffee, is grown.

Such Natural Riches, So Few to Use Them

Although a rich and beautiful region, with gold, silver, and other minerals in its mountains, great pasture lands, forests of rare and valuable woods, and a very fertile soil, Central America has little more than 25 people to the square mile. The mines and forests are almost untouched, little land is cultivated, and there is scarcely any manufacturing. The old Indian method of planting by making holes with a pointed stick is still employed in all but the most thickly settled areas. This backward condition is largely due to the isolation in which the several colonies were kept by Spain during the three centuries in which the region belonged to her, when commercial intercourse with countries other than Spain was prohibited. Even after 1821 when following a revolution the colonies declared their independence, there was little change in this respect. Civil wars and revolutions caused a periodic destruction of property and planted fields. The new republics still had no direct means of communication with Europe or North America, and all the important cities were separated from the east coast by an almost impassable jungle and mountainous country. It was therefore not until the construction of an interoceanic railway in Panama, and more recently in Guatemala and Costa Rica, that these countries of Central America obtained an outlet upon the Atlantic. Even now transportation is extremely difficult in most places. Roads are poor and often impassable even by ox-cart.

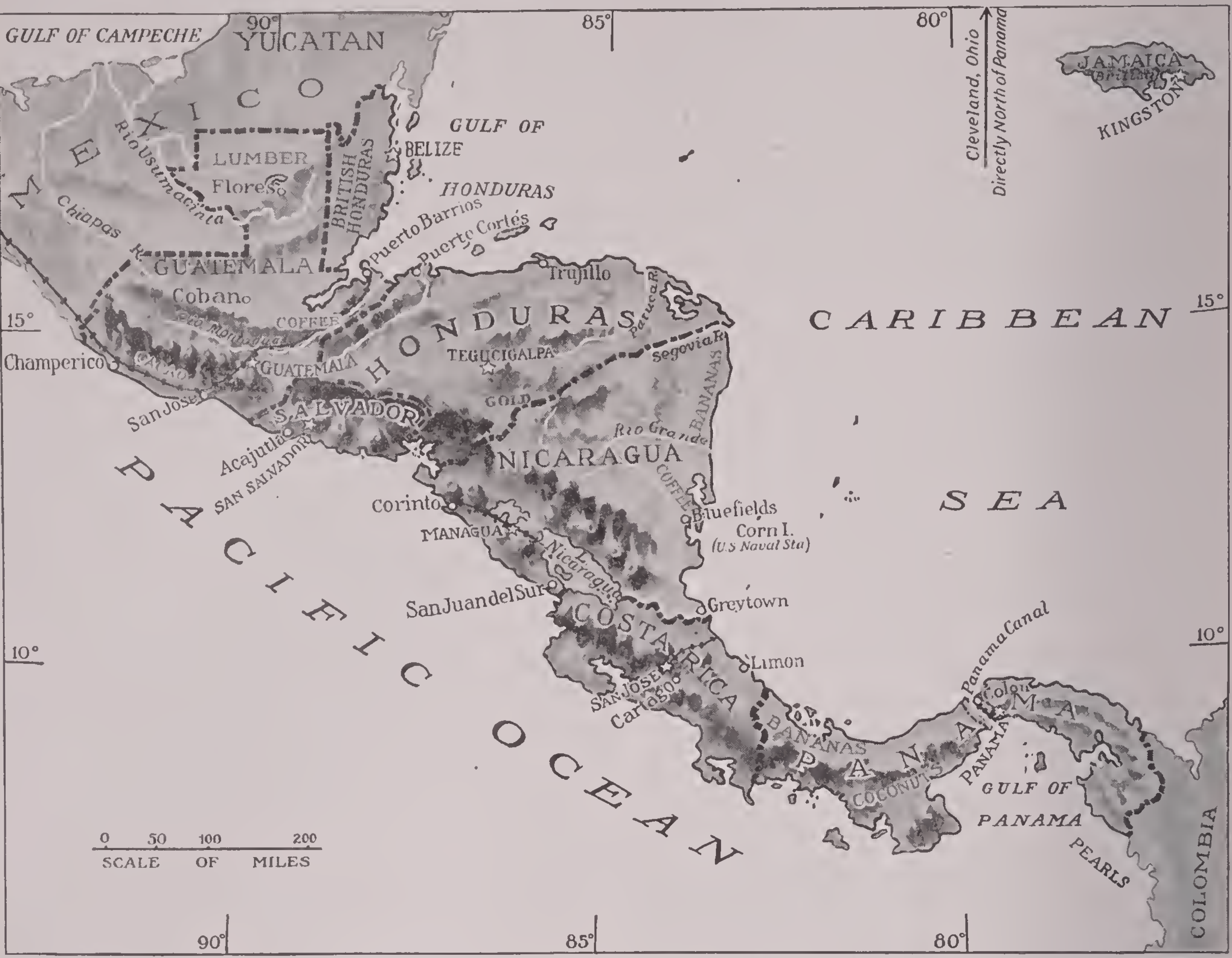
What the Coffee Plant Did for Central America

The introduction of the coffee plant into Central America, not long after the countries became independent, did much to develop the commerce of the country. Owing to the high price which its excellent quality commanded in Europe, it was soon exported in large quantities. Immense coffee *haciendas* or estates, many of them producing 200,000 to 1,000,000 pounds each year, are now scattered over the fertile slopes of the volcanoes on the coast. They are controlled by a comparatively small number of people who obtained possession of the land in colonial times, and who still maintain a dominant place in the community. The laborers are descendants of the native tribes of Indians who were enslaved in the 16th century, and have never entirely regained their independence. They still remain the largest element in the population which resulted from a fusion of the Spanish, the aborigines, and the negroes. Although they have adopted the Spanish language and religion, they are still Indian in civilization and standards of living. Whether in cities or in the country, they live in one or two-room huts of adobe or wood with dirt floors and thatched roofs. Corn, beans, rice, and coffee form their diet. Because of the primitive living conditions throughout Central America disease is common and the death rate high. The hookworm, with which half the people are estimated to be infected, has done incalculable harm. In the last 25 years education has helped the masses in the more advanced republics, but the percentage of illiteracy except in Costa Rica is still large.

In Volcanoes She Leads the World!

It is said that Central America has more volcanoes in proportion to its size than any other country. They range along the Pacific shore and spread to the Caribbean only where the land contracts into a narrow neck. Volcanic eruptions and earthquakes

WHERE THE BACKBONE OF AMERICA STANDS ALONE



From Alaska to Patagonia runs an almost continuous mountain chain, forming the backbone of the American continents. In North and South America this backbone slopes down into broad stretches of level land; but in Central America it rises from the oceans with comparatively little surrounding land. By means of the Panama Canal, across the isthmus, man now has cut the two Americas apart.

are very common in this region. In 1917–19 both Guatemala City and San Salvador were destroyed, and there is scarcely a city between Mexico and Colombia but has suffered from earthquakes or volcanic eruptions. The volcanoes are, however, a blessing as well as a curse to the region, for their lava enriches the soil beyond the power of the most costly fertilizers.

The eastern slope is covered by a vast jungle, which until recently was inhabited only by a few groups of uncivilized Indians along the shore and a few settlements of woodcutters who traded in mahogany and other valuable woods. Huge trees 20 feet in diameter, with thick vines wound about their trunks, hide their tops in an impenetrable mass of green hundreds of feet above. Bushes with brilliant foliage fill every vacant spot. Alligators swarm the rivers, reptiles exist in almost endless variety, and insect and bird life is even more abundant. Ants may sometimes be seen marching in a column three or four miles long, and Costa Rica alone has twice as many species of birds as all Europe. The atmosphere is moist and hot and very unhealthful. Yet into this region an American corporation ventured, clearing and planting great banana farms, and building a net of railways to carry the perishable fruit to the ports, from which it is shipped in fast steamers to the United States and Europe.

Uncle Sam's Business with the Five Republics

The five republics, only 150 miles distant from the Gulf ports, are one of the most promising fields for the expansion of American commerce and the investment of American capital. At the present time the United States easily occupies the leading place in their foreign trade, supplying the greater part of the imported foodstuffs, hardware, and machinery, and a very considerable part of the textiles.

Central America was discovered by Columbus in 1502. Costa Rica was conquered by the Spaniards after 1513, and the rest of the country was subjugated between 1522 and 1525 by Hernando Cortez after his conquest of Mexico. Great Britain colonized British Honduras in the 18th century and exercised a protectorate over the Mosquito coast until 1860. The rest of Central America remained a Spanish dependency bearing the name Guatemala (with

A GLIMPSE INTO THE EARLY HISTORY OF CENTRAL AMERICA

Europe's first interest in Central America was aroused in the early 16th century by the hope of finding gold and silver there. The first episodes in its history consisted of the adventures of Spanish explorers and conquerors. The names of these bold pioneers—Balboa in particular, who was the first to see the Pacific Ocean—will live long in history. Across the Isthmus of Panama was built the mule trail by which the treasures of Peru were freighted to Porto Bello, to avoid the long and dangerous voyage around Cape Horn. The drawing shows one of these Spanish mule-trains bringing cases full of treasure over the mountains under guard of Spanish soldiers. Soon this treasure will be in the hold of a Spanish galleon, on its way to Spain.

the exception of Panama, which belonged to New Granada) until the revolution of 1821, which established the present independent republics, with governments similar in form to that of the United States. Area, about 213,000 square miles; population, about 5,500,000.

CENTRIFUGAL FORCE. Have you ever watched an automobile go rapidly around a corner? If so, you have seen how likely it is to "skid" outwards, particularly if the road is wet and slippery. The automobile seems to want to go straight ahead and not to follow the curve of the road. To hold the automobile on the curve we have rough tires, so as to increase the friction of the tires with the road. In "speedways" for automobile races, the curved track is slanted inwards, so as to help overcome this "force" to go outwards. For the same reason the outer rail of a railroad track is raised higher than the inner rail at a curve. This tendency of bodies to fly outwards at curves is called the "centrifugal force." It is the resistance that the body offers to changing its direction of motion.

We have instances of centrifugal force wherever we have a rotating body. Thus dirt and water are thrown off tangent to the rotating wheel of a bicycle. If you whirl a stone in a circle at the end of a string you feel a pull outward on the string; the more rapidly you revolve the stone, and the heavier the stone, the greater is the pull, that is, the greater is the centrifugal force. With a little skill, you can whirl a bucket of water round your head without spilling the water; for owing to the centrifugal force the water holds to the bottom of the bucket.

Many uses are made of centrifugal force. In laundries the water from wet clothes is thrown off by rotating them in a cylinder with perforated sides. In dairies, the cream separator uses this force to separate the heavier milk from the lighter cream, for when the natural milk is whirled in a properly shaped vessel, the cream stays at the center and the milk goes to the outside; the cream can then be drawn off. To keep a steam engine at a constant speed, some form of centrifugal governor is used. One form, invented by James Watt for his engine, consists of two heavy balls hung on arms, which fly out when the engine goes too fast, and drop when it goes too slow. By means of levers the opening which admits the steam is made larger or smaller so as to hold the engine at a constant speed (*see* Steam Engine).

CERVANTES SAAVEDRA (*sêr-văn'tēz sä-ä-vä'drä*), **MIGUEL DE** (1547–1616). When a book lives for over three hundred years, appeals to young and old of many nations, and has a new freshness for each new generation of readers, you may be sure that it possesses some rare qualities. The Spanish romance entitled (after its hero) 'Don Quixote' is one of a very few such books.

Merely as a record of thrilling adventure, the life of its author, Miguel de Cervantes, will interest us. The son of a small-town apothecary-surgeon, but brought up in the capital Madrid from his seventh year, young Cervantes from an early age showed a poet's talents and a poet's distaste for prosaic business. At the age of 22 he sought his fortune in Italy, and for a time seemed likely to find it as a member of the household of a cardinal at Rome. Such a life, however, proved too tame for his spirit, so he turned soldier and for five years served in the Spanish fleets and armies.

At the time of the great battle of Lepanto (in 1571) in which the fleets of Philip II crushed and destroyed the Turkish forces in the Mediterranean, Cervantes was on board ill of a fever. Despite the remonstrances of his comrades, he insisted on rising and taking his full share in the fighting—with the hard result that he received three gunshot wounds, one of which permanently crippled his right hand.

Captured by Pirates and Sold into Slavery

Four years later, while returning on leave of absence to Spain, the ship on which Cervantes had taken passage was captured off Marseilles by Barbary pirates, and he and his brother were carried as slaves to Algiers. When the sum sent by their parents proved insufficient to ransom both, Miguel insisted that his brother be freed while he remained in slavery. When an attempt at escape failed, he took upon himself all the blame before the viceroy, in order that his comrades might go unpunished. The viceroy, struck by his indomitable bravery in the face of a threat of death, then bought him from the renegade Greek who was his master.

After five years of Mohammedan slavery, Cervantes was at last ransomed for 500 gold ducats, raised by his relatives and friends. Upon his return to Spain he wrote a number of plays and a novel. As a petty government official he helped to provision that great Armada, which failed so ingloriously in the attempt to chastise the England of Queen Elizabeth. But Cervantes was a poor business man, and was reduced to such straits that he was obliged to borrow money for a new suit of clothes. For a time he was even thrown into prison, apparently owing to money difficulties. One consolation was his, however,—that of winning the first prize (consisting of three silver spoons!) at a poetic contest held in the city of Sargossa, in 1595.

With the publication, ten years later, of his immortal work 'Don Quixote' (pronounced *dŏn kwiks'ōt*, in Spanish *dōn kē-hō'tā*), Cervantes' fame became secure. The second part, published in 1615, refutes the maxim that "no second part was ever good." Its humor is more subtle and mature, the literary style more even in its excellence, the hero more quaintly dignified and lovable, and the squire more comically shrewd and faithful than in the first part.

Cervantes, the greatest of Spanish writers, died on the very day that Shakespeare, the greatest of English dramatists, passed from earth. Truly those were "spacious days." Undreamed-of vistas were opening in every direction through the exploration and conquest of the New World and the broadening of men's minds with the progress of science. It is not surprising that in that stirring atmosphere there should be bred heroic men of action, gifted and versatile artists and poets, dramatists and novelists of unsurpassed powers.

Cervantes' famous work is a satire or burlesque on the long-drawn-out romances of chivalry such as 'Amadis de Gaul', which had so greatly influenced Spanish literary taste, national ideals, and everyday manners. Modeled at first on the fine old stories of King Arthur and other legends, these works had degenerated into sickly mixtures of fairy tales and extravagant melodrama. The genuine chivalry or knighthood was long past, and Cervantes showed that these romances only turned people's heads and gave them mistaken notions of life.

Don Quixote and his squire Sancho Panza are recognized as Spanish types, drawn with remarkable fidelity. They are today among the most celebrated characters of fiction. The story also presents a brilliant panorama of Spanish society at the close of the 16th century. All classes of people are encountered on the highways—grandees and kitchen wenches; priests and traders; poets, farmers, sentimental damsels, and mule drivers; convicts, barbers, and veiled Moorish beauties. Meetings with these wayfarers give occasion for a bewildering succession of lively episodes, which vary from broad farce to tragedy, from comedy to pathos.

This book of Cervantes, it has been said, "has contributed more than any other single work to the development of the modern novel." It has been translated into all modern languages, and has been printed, in Spain and abroad, in over 700 separate editions. Cervantes also wrote over 30 poetical dramas, and a large number of other works both in prose and verse.

THE STORY OF DON QUIXOTE

IN a certain village of the province of La Mancha in Spain (so Cervantes tells us), there lived a quaint old gentleman about 50 years of age, tall, thin, and gaunt-featured. His means were small, for he had sold many acres of land in order to buy tales of knight-errantry. Whenever he was at leisure (which was nearly all the year round) he gave himself up to the reading of those ancient books of chivalry. They were mostly extravagant tales of impossibly noble and brave knights performing fantastic deeds of valor, but this foolish gentleman took them all for true histories. His brain became so filled with all that he read of enchantments, quarrels, battles, wounds, wooings, loves, agonies, and all sorts of nonsense, that finally with much reading and little sleep he lost his wits. Then he hit upon the strangest notion that ever man of that time had, and that was to become a knight-errant himself, roaming the world over in full armor and on horseback, in quest of adventures like the knights of old.

Rosinante and Sancho Panza

So he furbished up his great-grandfather's rusty armor, took lance and buckler, and adopted the high-sounding title of Don Quixote de la Mancha. His sorry-looking old nag he named Rosinante, which meant "formerly a plough-horse." Of course a true knight must have a lady to be in love with, so he chose to honor a farmer's buxom daughter (whom he scarcely knew) and called her by the romantic and musical name of Dulcinea del Toboso. Deciding that he needed a squire to attend him, he engaged a short, fat farm laborer, named Sancho Panza, an honest, faithful clown of a fellow, whose wits were compounded of rustic ignorance and shrewd common-sense. In reward for Sancho's services, Don Quixote promised to make him governor of the first island or kingdom he should conquer.

The Famous Attack on the Windmills

So the melancholy knight on his raw-boned steed, followed by his comical squire on an ass, set forth upon their adventures. They had not been long on the road before they came in sight of 30 or 40 windmills on a plain.

"Look yonder," said Don Quixote, "more than 30 monstrous giants present themselves. I shall encounter and slay them, and with their spoils we will enrich ourselves, for it is fair war and a good service to sweep such evil fellows off the face of the earth."

"What giants? What you see there are windmills," said Sancho Panza in amazement.

"It is clear," answered Don Quixote, "that thou art not experienced in the business of adventures. They are giants, and if thou art afraid, betake thyself to prayer while I engage them in fierce and unequal combat." Then setting spurs to his steed, he cried out to the windmills: "Fly not, ye cowards and vile creatures, for it is but a single knight that attacks you!"

SANCHO PANZA WEEPS OVER HIS STEED

Sancho Panza, squire to Don Quixote, addresses his faithful companion as follows: "Come hither, my friend; thou faithful companion and fellow-sharer in my travels and miseries."

Charging as fast as Rosinante could carry him, he fell full tilt upon the first mill. But the wind whirled the sail around with such force that it shivered his lance, dragging after it horse and rider, who went rolling over and over on the plain.

Sancho Panza hastened to his master's assistance. "Bless me! Did I not warn you they were only windmills? No one could think otherwise unless he had something like windmills in his head."

"Friend Sancho," replied Don Quixote, ruefully, "I verily believe these giants have been turned into mills in order to rob me of the glory of vanquishing them; but such wicked arts will avail but little against my good sword."

Battered and bruised, but undismayed, the knight with some assistance remounted his lame old horse and rode away, still confident that he should find chances for knightly adventure.

Not long after this, he and Sancho Panza made their way to an inn. Don Quixote declared it was a castle, and acting accordingly, got himself into many absurd situations. And when he set out again he aroused the anger of the innkeeper by refusing to pay his bill, for, he said, it was contrary to the laws of knight-errantry to pay for lodging or anything else. "Thou art a blockhead and a pitiful innkeeper," he said, clapping spurs to Rosinante. But poor Sancho's bones were made to pay for his master's folly, for the people of the inn seized him and tossed him in a blanket until he could hardly stand.

It would take too long to tell all Don Quixote's adventures, as he went about righting wrongs that did not exist or that he made worse by his misguided interference—rescuing maidens from supposed danger or distress, killing imaginary giants, and challenging inoffensive wayfarers. At length some of his friends, disguising themselves, went in search of him. They made the foolish knight believe that he himself was under enchantment, put him into a cage, and brought him home. But after a time Don Quixote and his squire again set out on yet another round of quaint adventures. But in the end he died at home and in his bed, with his weeping niece and friends about him—quite sane again, and crying out against the odious histories of knight-errantry which had led him to commit such follies.

CEYLON'. The beauty of its scenery and the richness of its soil have won for this island colony of Great Britain the name "Pearl of the Orient." It is about the size of West Virginia, having an area of over 25,000 square miles, and lies 60 miles southeast of India.

Rolling plains cover most of the island, rising toward the south into lofty mountains. The most remarkable elevation is that known as "Adam's Peak," visible at a great distance from the sea and famous as the sacred mountain from which Buddha, according to his followers, ascended to heaven.

The tropical vegetation is extremely luxuriant and beautiful, including tall tree-ferns, scarlet-flowering rhododendrons, magnificent palms, and valuable ebony and satinwood trees. The largest animal is the elephant, which is hunted and tamed as a beast of burden. The heat is moderated by the sea breezes, and where the jungle has been cleared and the land drained the climate is more healthful than much of

India. The seacoast affords several excellent harbors, the best being that of Colombo, the capital.

Tea, coffee, rice, copra and other coconut products, rubber, cinnamon, and cinchona bark (from which quinine is made) are the most important vegetable products. Ceylon ranks third among the tea-producing countries of the world. Among mineral products the most important is graphite, from which lead pencils are made. The precious stones of Ceylon are famous and include moonstones, garnets, topazes, and amethysts; and less numerous but very fine specimens of sapphires and rubies. The pearl fisheries on the coast, which have been noted for nearly 2,000 years, form a British monopoly.

About two-thirds of the population is composed of Sinhalese or Ceylonese, descendants of immigrants who came from northern India about 500 B.C. They are a gentle and peaceable but rather effeminate people. The men look very much like women, for they have delicate features; they wear skirts and earrings; and their long hair is held back with large tortoise-shell combs. There are several other races, including the Tamils (from southern India), Moors, Malays, and Veddahs. The Veddahs, supposed to be the original inhabitants, build houses in trees in the wildest parts of the island and live on wild fruits and animals. Along the coasts is a sprinkling of English, Dutch, and Portuguese. Buddhism has been the prevailing religion of the island since the 3d century B.C. but the Hindu and Mohammedan faiths also have many followers. Christianity has made considerable progress in recent years.

Ceylon has the distinction of being the home of the "oldest historical tree in the world." It grows at Anuradhapura, the ancient capital of the island, where it was planted in 245 B.C. as a cutting from the famous Bo Tree of India, under which Gotama (Buddha) is said to have received the inspiration which led to the founding of the Buddhist religion. The tree, a species of fig, has its ancient branches upheld by pillars and its enormous roots banked carefully with earth by the faithful. Pilgrims count it a rare privilege to visit this living relic.

In the north of Ceylon ruined cities have been discovered pointing to a splendid ancient civilization. Excavations have brought to light great relic-houses, beautiful palaces, and temples which for architectural grandeur rival those of ancient Rome. Little was known of the island in Europe until 1505, when it was invaded by the Portuguese, who a few years later established a settlement there. These colonists were driven out by the Dutch in 1658, who were in turn conquered by the British in 1796, while Holland was ruled by Revolutionary France. Since that time Ceylon has remained a British colony. It is governed separately from India, with its own governor and executive council responsible to the Colonial Secretary in London. The capital and largest city is Colombo (population 211,000). Population of the island, about 4,700,000.

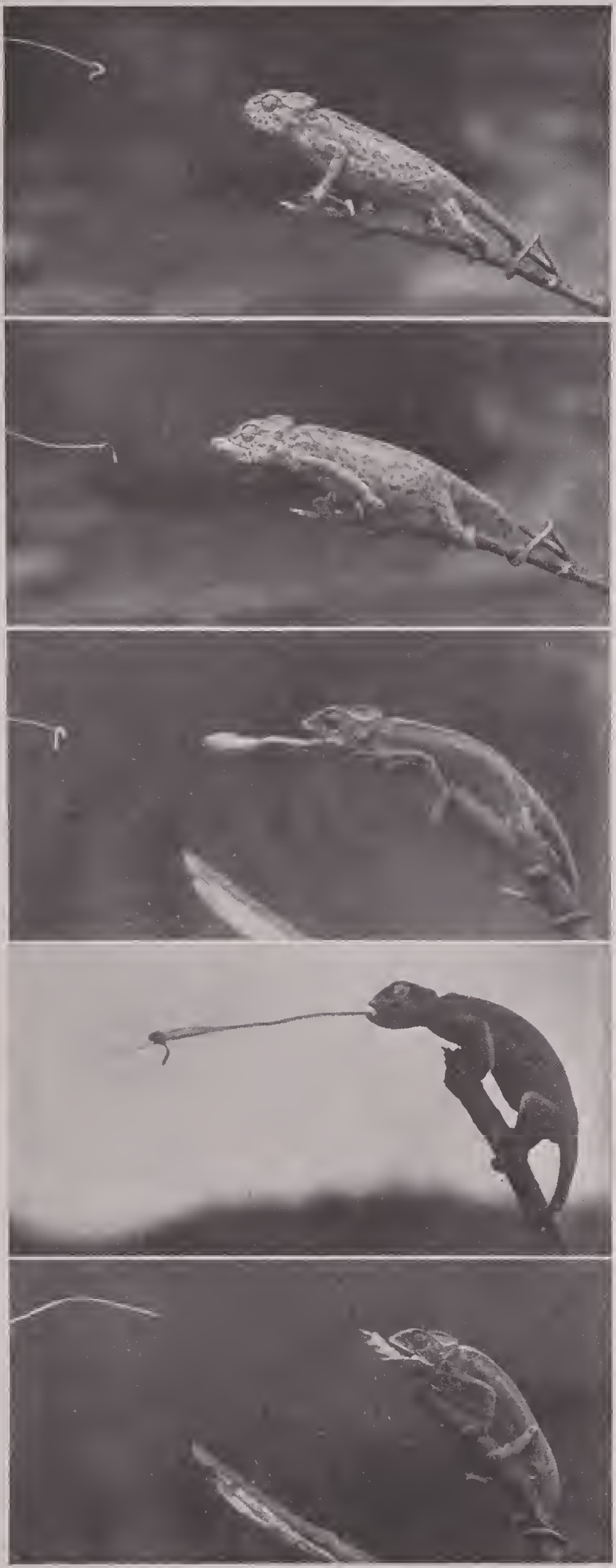
CHALK. When you write on the blackboard with a piece of chalk, you hold in your hand the mineral remains (shells) of thousands of tiny creatures called *foraminifera*, which died millions of years ago. They lived in the seas, and as they died their tiny shells sank to the bottom and became consolidated into the soft limestone known as chalk. After long periods of time these beds were elevated and became parts of the dry land. This process of making chalk is still going on in warm ocean waters and perhaps some day earth disturbances will raise these deposits for the use of future generations.

It has been estimated that it takes more than a million of these shells to form a cubic inch of chalk, but the number of these minute creatures was so incredibly large that great chalk deposits are found in many parts of the world. In the United States deposits occur in Texas, Kansas, and some other states of the great plains. Towering cliffs of chalk border the south coast of England, and great beds of it underlie large areas of England and France. In color chalk is usually white or whitish, and chemically it is chiefly carbonate of lime.

Chalk is largely used in cement making. When washed free from grit it is called whiting, and is used for making putty and as a polishing powder. Refined chalk is also used in medicine. Mixed with some binding substance it becomes the crayons we use for marking. Colored crayons contain pigments also to give the desired color. In addition chalk is employed in making tooth powders, paints, and many chemical compounds. French chalk is not properly chalk at all, but a variety of talc (*see* Talc).

CHAMELEON (*kă-mē'lē-ŏn*). The chameleon is the world's champion turncoat. One moment it is a brilliant green; the next it may be a gray-black, or chestnut and black, or covered with yellow spots. This is nature's way of protecting this sluggish little lizard, for it moves so slowly that if it did not have the power of taking on the color of its surroundings, and so making itself almost invisible, it would soon be exterminated by snakes and birds which prey upon it. The color changes are accomplished by layers of cells beneath its transparent skin, containing yellow, black, and red coloring matter. These cells are under the control of the nervous system, and by contracting and expanding produce changes in coloration.

Even without this power the chameleon would be one of the most extraordinary of animals. Its great protruding eyes are entirely covered with eyelids except for a tiny round hole, and the lids move with the constantly rolling eyes. What is still more amazing, the chameleon can roll its eyes independently in any direction, so that one eye may be looking at a fly in front of it, while the other keeps watch over the animal's shoulder. As another compensation for its slowness, the chameleon has a tongue which it shoots out like a flash of lightning, more than half the length of its body, skilfully catching unwary insects on the sticky end.



HOW THE CHAMELEON CATCHES HIS MEALS

When hungry, the Chameleon "lies low" with its color adjusted to its surroundings. When an insect passes by, the chameleon shoots out its long tongue, striking its prey with the skill of a trained marksman. The insect is glued to the tip of the sticky tongue and is drawn back and swallowed. A motion-picture camera caught the views above.

The true chameleons, of which there are more than 50 species, are found only in Africa and a few other parts of the Old World. The best-known species has a body about six inches long and a tail nearly as long again, with which it clings to twigs. The so-called American chameleon belongs to a quite distinct branch of the lizard family, the *Iguanidae*. It is smaller and more active than its Old World namesake, but has the same remarkable property of changing color.

Scientific name of common chameleon, *Chameleon vulgaris;* of American chameleon, *Chameleon carolinensis.* .

CHAMOIS (*chăm'ĭ* or *shȧ-mwä'*). "Nimble as a chamois," we often say when we speak of some feat of agility, for this small goat-like antelope of the mountains of middle and southern Europe is one of the fleetest and most active of creatures. When alarmed it will flee to the most inaccessible places by a series of prodigious leaps, across chasms and up or down the face of almost perpendicular cliffs. The sole of its hoof is slightly depressed below the outer margin, thus enabling it to get a foothold on the slightest projection.

Chamois live in herds of 20 or 30 and their senses are so acute that they are among the hardest of animals to hunt. When feeding they post a sentinel, who warns of the approach of danger by stamping and making a whistling noise. Chamois-hunting used to be a favorite pursuit in the Swiss Alps, but the animal is now rare and is protected by law.

It dislikes warm weather, ascending in summer to the regions of perpetual snow and only coming down to the forests in winter. Under its coat of coarse reddish-brown hair a thick under-fur grows in the winter time. Its slender body is about three feet long, and two and a half feet high at the shoulders, with a short black tail. From the forehead rises almost vertically a pair of slender black horns six to eight inches long, which hook back at the top.

The fine soft leather known as "shammy" was originally made from chamois-skin, though most of the skins now sold under that name are sheep-skin.

Scientific name, *Rupicapra tragus.* The chamois is the only species of its genus and is readily distinguished from all other ruminants by its vertical backwardly hooked black horns, which are common to male and female, although smaller in the latter.

CHAMPLAIN', SAMUEL DE (1567–1635). At about the same time that Captain John Smith was struggling to keep alive the small English colony of Jamestown, Samuel de Champlain, the "Father of New France," was planting the seed of French power in America at Quebec.

Champlain, the son of a French sea captain, was born in a small town on the shores of the Bay of Biscay, early mastered seamanship and navigation, and for a time fought under King Henry IV in the Huguenot wars. His interest in America was first aroused in 1599 when he commanded a ship which sailed to the West Indies. He visited Mexico City, and in a report to the French king he suggested that a canal across the Isthmus of Panama "would shorten the route to the Indies by 1,500 leagues." His next voyages took him to the St. Lawrence, 1603, the Bay of Fundy, where he founded Port Royal, 1605, and down the coast as far as Marthas Vineyard.

Then in 1608 he came again to America, this time as lieutenant-governor to found a colony on the St. Lawrence. He selected the site at Quebec, where he founded the first white settlement and gave it its present name.

For 27 years thereafter, except for a brief period when he was a prisoner in England, Champlain nursed the infant colony. He left the fur trade to the traders and set himself the task of exploring the interior and firmly establishing his country's claims in North America. He discovered Lake Champlain in 1609, and traversed the wilderness as far as Lake Superior; and he worked hard in the Old World to interest influential people in the vast possibilities of New France. This called him to France frequently, sometimes as often as once a year, and a journey to Europe in those days was a serious undertaking.

One mistake, as was later seen, Champlain made—he did not rightly estimate the power of the Iroquois Indians. Perhaps he was unable to preserve neutrality between them and their enemies, the Hurons and Algonquins. At any rate he allied himself with the latter in 1610, and helped them to defeat the Iroquois in a battle on the shores of the lake which has since borne his name. This was a victory dearly bought, for it exposed the little colony to a hundred years of desperate conflict with the Iroquois, who thenceforth united with the English, and in 1759 aided them in their successful attack on Quebec.

With the other Indian tribes, however, this first and greatest lieutenant-governor of New France was on good terms. During his last years especially, one of his great desires was to bring the heathen tribes into the fold of the Catholic church. It was said of him that "while he cared little for their bodies, his solicitude for their souls knew no bounds."

CHAN'CELLORSVILLE, Battle of. At Chancellorsville, Va., on May 2 and 3, 1863, the Confederates gained one of their greatest victories in the Civil War. The Union army, though superior in numbers, after three days' terrible fighting was defeated and retreated across the Rappahannock, with a loss of 18,000 men. The Confederate loss was only 13,000, but it included the brave and able Stonewall Jackson, who was accidentally shot by his own men and died eight days later. (*See* Civil War.)

CHANNEL ISLANDS. When you see the beautiful fawn-colored Jersey cows, or the handsome Guernseys with their white markings, think of the Channel Islands; for it is to these tiny British possessions off the coast of France that we owe two of our most famous breeds of dairy cattle.

The Islands from which these breeds come—Jersey and Guernsey—with the addition of Alderney, Sark, and a few tiny islets, have a total area of only 75 square miles, about the size of the city of Cincinnati. But every available acre is under cultivation or used for pasturage, and the soil produces so abundantly in the delightfully mild climate that immense quantities of vegetables, fruits, flowers, and dairy products are shipped to England, about 100 miles away.

Visiting these islands is like sailing back into the enchanted land of yesterday; for few places in the world have retained so many of the customs and laws of the Middle Ages. The ancient charters, framed nearly a thousand years ago by the dukes of Normandy, still remain largely in force; and much of the land is held under the same old system of tenure that existed in feudal days. One tenant, for instance, still owes his landlord one donkey every year and a cake made from a bushel of wheat. Another is required to pay 18 eels (or the money equivalent); another, a chicken with a tail at least one inch long.

These and many other curious survivals testify to the days when the Channel Islands were a part of ancient Normandy, whose ruler, William the Conqueror, became master of England. The farmers still speak the old Norman-French, and French is the official language of the courts and the local assembly. The islands are in most respects self-governing, and have their own copper coinage, though they are administered by lieutenant-governors sent from England. The people have stubbornly refused to submit to a system of import duties—a fact which partly explains the cheapness of living.

These sunny islands, where there is a difference of only 20 degrees between the average winter and summer temperatures, are popular vacation spots. Population, about 100,000.

CHARADE (*shȧ-rād'*). The charade is a close relative to the riddle. It is a syllable-puzzle game. The answer is guessed by putting into one word a number of short words described independently by acting. In the game of charades the company is divided into two sides, each in turn presenting such a word to its opponents. The word is first described by giving its part of speech, the number of syllables it contains, and the number of scenes necessary to present it. The description may be in words, as in the following: "My *first* is everything, so is my *second*, my *whole* is also." The answer is "also."

Charades are more frequently acted out as little pantomimes or dialogues of one or more scenes. *Syrup* could be represented by a man on a chair ("sir-up"); *metaphysician*, by two people meeting, one saying, "Good morning, Doctor." Such words as *benefit* ("Benny fit"), *ingratiate* ("in gray she ate"), *character* ("care actor"), are good puzzlers.

A good charade, requiring both acting and dialogue, is such a word as *innkeeper*. It would be announced as, "A noun, common, singular, three syllables, two scenes." In the first scene the word *in* should be both acted and spoken, making use of such remarks as: "Keep this *in* your hand"; "What have you *in* your pocket?"; "May I look *in* your purse?"; "You will find it *in* the book," etc. In the second scene, the various members of the side should take the part or animals, barking dogs, roaring lions, growling bears, all under the care of a *keeper* who should be conspicuously "keeping" the menagerie. If the word cannot be guessed, a third scene should be arranged in which the whole word *innkeeper* is used in the dialogue. Other words to act out are *bartender, icicle, Indian, Thanksgiving*, and *babyhood*.

CHARCOAL. The porous black brittle substance left when wood or bones are "charred," or partially burned, is called charcoal. It is an impure variety of carbon, and because of its property of absorbing enormous quantities of gases it has many uses.

Animal charcoal, or bone-black, is made by heating bones in a closed vessel or retort, thus driving off gases, water-vapor, and oil. It is seen usually in coarse grains from the size of peas to pin-heads, and is used mostly in removing colors from liquids. Syrup of sugar, for example, is allowed to drip through a layer of bone-black; all color particles are held by the charcoal and the syrup runs through clear and colorless. Bone-black is also used to absorb disagreeable smells. Lamp-black, made by burning oil, is an important ingredient in paints and inks.

Wood charcoal is the most important variety. When wood, which consists chiefly of carbon, hydrogen, and oxygen, is heated in the open air, it burns away, leaving only a small quantity of white ash. But if the air is partially cut off, only the volatile matter escapes, leaving the carbon. Most charcoal is made in "charcoal pits." Billets of wood are stood on end in rows, making a large cone-like heap; this is covered with turf or moistened ashes, and holes are left at the bottom for air to get in. An open space for a chimney is also left at the top. The wood burns slowly from top to bottom and from center to outside. When fully burned, the heap is covered and left to cool for two or three days. One hundred parts of wood average 24 parts by weight of charcoal. Charcoal-burning is an important industry in European countries, especially in the mountains. When the burning is carried on in closed retorts, more charcoal is obtained, besides large amounts of gas, tar, and other valuable by-products.

Since charcoal burns without smoke or flame, it is much used as a fuel, especially in the arts. Charcoal fires are also far superior to any others for broiling meats. Other uses are in the manufacture of gunpowder and polishing powder and as a heat-nonconductor in refrigerators. Fence posts, telegraph poles, and piles driven in mud or beds of rivers for foundations are often charred on the outside to preserve them from decay. Charcoal is also used in water filters, for tooth powder, and as a medicine. Charcoal made from coconut shells, as well as wood charcoal, was extensively used in making gas masks during the World War. The stones or pits of various fruits were also found useful for making charcoal for this purpose.

CONQUEROR, LAW-GIVER, *and* EMPIRE BUILDER

> ***AMERICA would have been discovered without Columbus, and the Protestant Reformation begun without Luther. But without Charles the Great—or Charlemagne, to give him his French name—the Roman Empire in the West could never have been revived by the Teutonic barbarians, and the whole course of subsequent history would have been different. Rightly, he looms across eleven centuries as one of the immortal figures of history, standing at the point where classical civilization ends and the Middle Ages begin.***

CHARLEMAGNE (*shär'lĕ-mān*) (742–814). The coronation of Charles the Great, in Rome, on Christmas Day in the year 800 A.D., was the central fact of the Middle Ages. As Charles, "in shape and gesture proudly eminent," his yellow locks tinged with gray, his cheeks furrowed with the toil of 20 campaigns, felt the crown placed upon his head, a new era began in the world's history.

Since the fall of the Roman Empire in the West more than three centuries before, Europe had been drifting toward the abyss of anarchy, disunion, and barbarism. Only the strong hand of Charles could check this fatal course and restore to Europe the ideas of unity, order, and centralization which had been the legacy of the Romans. Only he could bring about the fusion of the barbarian vigor of Northern Europe with the ancient traditions of Imperial and Christian Rome. And so the shout of the people in the old church of St. Peter's, "To Carolus Augustus, crowned by God, mighty and pacific emperor, be life and victory," marked one of the few events which we may say changed the history of the world. The cloak of Augustus fell upon the shoulders of a Frank; the West split with the East, and modern Europe began. But although Charles was already emperor of the West in fact though not in name, and although he was certainly looking forward to the assumption of imperial authority, the time and manner of the coronation were not of his choosing. Unexpectedly the pope placed the crown on his head as he knelt in prayer, and we are told that Charles later declared he would not have set foot in the church that day if he could have foreseen the pope's design.

The man on whom this honor was thrust had ruled the kingdom of the Franks for more than 30 years. He was the son of Pepin the Short, the bold and able "mayor of the palace" who had seized the throne of the Frankish kingdom from the "do nothing" Merovingian puppet kings. He was the grandson of Charles Martel, who in 732 had saved Christendom from the onrush of the Saracens at

Tours. At 26 Charles had inherited the kingdom of the Franks, with his brother Carloman. Three years later, in 771, Carloman had died and Charles had been left sole ruler of all the Franks.

A dark outlook had confronted the young king. Europe was torn by dissensions. The Roman church was striving to assert its power in Italy against the Lombards on the one hand, and the claims of Constantinople on the other. The northern half of Europe was still in pagan darkness. Ignorance, superstition, greed, treachery, and violence blocked the way. The new ruler needed all the courage he had inherited from his grandfather, and all the strength and astuteness of his father, to meet the situation which confronted him.

With the sword in one hand and the cross in the other, Charles set out to bring order to an entire continent. He launched in 772 a 30 years' campaign which at first conquered and then Christianized the heathen Saxons in the North. He subdued the barbarian Avars on the Danube. He compelled the rebellious Bavarian dukes to submit to his rule. He crushed Desiderius, the treacherous king of the Lombards, and confirmed the pope's temporal possessions in Italy. He carried his sword to the very borders of the Moorish domain in Spain.

Aided in his later campaigns by his three sons, Charlemagne (as he came to be called in French history) had at the time of his death in 814 extended his dominions over approximately the same territory which, exactly a thousand years later, was held in the shortlived grasp of Napoleon Bonaparte. From the Baltic Sea to the Spanish marches, and from the tip of Brittany to the lower Danube, the Emperor of the West held sway.

But, unlike Napoleon, Charlemagne was able to hold his vast domain together. Everywhere Christianity, commerce, agriculture, schools, and a just administration of civil and church laws had followed in the wake of the Frankish armies.

CHARLEMAGNE HOLDING COURT

The great Emperor was ever ready to hear the grievances of his people and often sat as judge in knotty cases. His decision in each case was written down by monks, and preserved. Charlemagne's wise and fair administration of justice contributed much toward building up the strength and unity of his empire.

Scarcely less momentous for the history of civilization than the gift of political unity was the work Charlemagne did in fostering education and the arts. When he came to the throne even the tradition of learning had well-nigh perished from western Europe. He himself learned Greek and Latin, and he founded schools in the monasteries and bishops' cathedrals to instruct the youth. From the learned centers of Italy, Spain, and other lands he brought great scholars to his court, notably the English monk Alcuin.

One of the ancient chroniclers of Charles has left us a characteristic story of the emperor's zeal for education. Finding that in a certain school the boys of noble birth had been neglecting their studies while the boys of poorer families had been faithful, Charles said to the diligent pupils:

"Many thanks, my sons, that you have taken such pains to carry out my orders to the best of your ability. Try now to do better still, and I will give you as reward splendid bishoprics, and make you rulers over monasteries, and you shall be highly honored in my sight."

But to the idle lads of noble birth he sternly said: "You sons of princes, you pretty and dainty little gentlemen, who count upon your birth and your wealth. You have disregarded my orders and your own reputations; you have neglected your studies and spent your time in games and idleness, or in foolish occupations! I care little for your noble birth and pretty looks, though others think them so fine. And let me promise you this: if you do not make haste to recover what you have lost by your neglect, you will never get favors from Charles!"

Charles' character was made up of strange contradictions. He who wept openly on the grave of his best-beloved son, Charles, is the same who in 782 at Verden had ordered the heads of 4,500 helpless Saxons struck off in one day. He compelled the Frankish clergy and nobles to mend their morals, but himself had four wives, two of whom he divorced without cause. He compelled the kings and princes of 25 provinces to kneel at his feet, yet his mother and two of his wives often overruled him in his own household.

AT TWENTY HE RULED HALF THE WORLD

Here you see the famous Hapsburg lip and chin as shown in Charles V. At 16 he became king of Spain, and at 19 emperor and ruler of Germany.

Charles is described by his contemporaries as being very tall, very active, and delighting in riding, hunting, and swimming. He was a man of wit, as is shown in the letters exchanged with the monk Alcuin, who for many years was his chief adviser.

At the death of Charles only one of his sons was living—Louis, the least capable. Within a few years the Frankish empire crumbled to pieces, and the quarrels over the fragments continued to bathe Europe in blood, from the time Lothringen (Lorraine) was named after Lothair, one of his near descendants, until the day in 1919 when the Peace Conference at Paris decreed the return of the province from Germany to France.

CHARLES V, HOLY ROMAN EMPEROR (1500–1558). In October of the year 1555 a strange procession wound its way through the rugged and hilly region of northwestern Spain. At its head rode an officer with a company of soldiers. Next came a gouty old man in a horse-litter. A body of horsemen followed, and in the rear toiled a long file of baggage mules.

As the train advanced into the more settled regions of the country it became evident that the occupant of the litter was a person of the highest consequence. Along the road the people assembled to show him reverence. Great lords gathered in his honor in the towns along the route, and in the cities the traveler was greeted by respectful deputations of officials and the bells rang out in merry peals, while enthusiastic crowds filled the streets.

This captive of the gout who thus passed in slow procession through the lands and cities of Spain was His Royal and Imperial Majesty, Charles V, Emperor of the Holy Roman Empire, King of Spain and the Netherlands, ruler of Germany and Austria, King of Naples and Sicily, and lord of the greater part of America. He was the greatest monarch in all the world, being lord of a realm vaster than that of Charlemagne. He had done what few kings have done before or since, voluntarily laid down his numerous crowns in the height of his power—weary of reigning and surfeited with greatness—and was retiring to spend the remainder of his life far from the pomp of courts in the privacy of a simple community of monks, at Yuste in western Spain.

At Yuste, according to report, he put in a large part of each day in regulating the large collection of clocks and watches which he had gathered with a view to having them keep time together. One day, so the story goes—with how much truth we cannot say—after trying in vain to so adjust his timepieces that they would all show the same time, he cried: "How foolish I have been to try to make men *think* alike when, do what I will, I cannot even make two timepieces agree!"

It is small wonder that at the age of 55 Charles had been glad to exchange his exalted position of emperor for the simple life of the monastery. Never in the history of the world had a boy been called upon to shoulder such burdens as was this son of Philip of Burgundy and Joanna of Spain, before he had completed his 16th year. At an age when most boys are still at school, he had been called upon to rule Spain, the Netherlands, the kingdom of Sicily and Naples in southern Italy, and Spain's vast possessions in the New World. Before he was 20 years old he had inherited Austria, and was elected emperor of the Holy Roman Empire, or Germany—a land of more than 200 states, great and small, which was just entering upon a great religious and social revolution.

Unpromising Youth of Charles

We know that this boy, upon whose possessions it might almost be said that the sun never set, caused a great deal of worry to his relatives and friends; for

Charles had been a backward retiring lad who could not even speak distinctly. It was even proposed at one time that his younger brother Ferdinand should rule in his stead. But Charles had developed into a shrewd far-sighted ruler who, as one of his subjects expressed it, "had much more at the back of his head than he carried in his face."

And he had need in his troubled reign (1519–1558) for all his prudence and foresight. In the first place Francis I, the young king of France, had laid claim to Charles' possessions in Italy, and three times Spanish armies had been obliged to defeat those of France before the French claim was given up. Then while Charles was fighting France in Italy and elsewhere, the Turks had poured up the Danube Valley taking his lands in Austria and Hungary. As soon as he had finished one war he had been obliged to begin another. Mohammedan pirates from northern Africa had also caused him trouble by swooping down on his coast towns of Spain and Italy and plundering them as well as preying upon their commerce.

In all of his wars the emperor showed personal bravery. At one time when reproved for recklessly exposing himself to danger he replied, "We were short of men and I could not set a bad example." And yet Charles was really a timid man who all his life long was afraid of mice and spiders.

While the emperor was busy warring with the French and Turks and pirates, and putting down a revolt at home in Spain—and reaping the fruits of Cortez' and Pizarro's conquest in the New World, greater trouble arose for him in Germany and the Netherlands. All Germany was aroused by the Reformation preached by Martin Luther and by his publicly burning the pope's bull or decree excommunicating him. The whole land was torn by the religious dispute and to it was added a civil war caused by a great uprising of the peasants, who saw in the new teachings a hope of freeing themselves from the burdens of serfdom.

Charles V and the Reformation

Charles V as a loyal Catholic was against Luther, and as soon as he was freed from his other duties he attacked the princes and cities of Germany who supported Luther's cause. He defeated them in battle and treated the defeated princes with great severity, but the Reformation was not crushed. Finally in 1555 he had been obliged to agree to a peace which provided that the ruler of each state should decide the religion for his people. This was a confession of defeat and a recognition of the Reformation.

Then it was that, disgusted because he could not put down the "heretics," and worn out by his many wars, Charles divided his inheritance between his brother Ferdinand and his son Philip II, and retired from the world to spend his few remaining years in the quiet of the gray old monastery.

Charles the Great or "Charlemagne" is counted as the first Charles of the Holy Roman Empire. The second was his grandson Charles the Bald, king of France; and the third his great-grandson Charles the Fat, king of Swabia and also for a brief time (884–887) king of France.

The Emperor Charles IV, 1347–78, was a member of the Luxemburg house and succeeded his father as king of Bohemia in 1346. Because of his partiality for his hereditary kingdom he was called "the father of Bohemia but the stepfather of Germany." He is chiefly remembered for his Golden Bull (1356) which settled the fundamental law of the Empire (*see* Holy Roman Empire).

Emperor Charles VI, 1711–40, was the father of Maria Theresa of Hungary and the last of the direct male line of the Hapsburgs. Charles VII, emperor 1742–45, was duke of Bavaria (a Wittelsbach) and was elected by French influence in opposition to the Hapsburgs.

CHARLES, KINGS OF ENGLAND AND SCOTLAND. Two kings only of this name have sat on the throne of England and Scotland, both of the house of Stuart.

CHARLES I, 1625–1649, to whose unhappy lot it fell to occupy the throne in the days of the Puritan Revolution, at a time when new ideas of the rights of the people were coming into sharpest conflict with the old claims of royal right or prerogative, ended his reign in martyrdom on the scaffold. From his birth, in 1600, he was a weakly child, unable to speak until his fifth year or to walk until his seventh. He outgrew both defects, however, becoming active in outdoor sports and making himself an accomplished scholar. He was deeply religious and sacrificed everything for his convictions. Yet he lacked the power of reading the temper of the times, and that gift of voicing the feelings of his subjects which had made his Tudor predecessors so powerful. He regarded everyone who differed from him as an enemy. While he prided himself on the legality of his measures, he failed to see that what had the sanction of the law might at times be the unwise thing to do. Much influenced by the few to whom he gave his confidence, he clung obstinately to any opinion he had once formed. Worse than all, he was secretive and evasive. Many of his views were so at variance with public opinion that he sought to conceal them; he made promises which he found himself unable to keep, and sometimes even entered into engagements with mental reservations which would enable him to escape doing what he did not consider to be for the public good.

Charles had succeeded his father, the shrewd but uncouth James I, in 1625; and the same year he welcomed at Dover his little bright-eyed queen, the French Princess Henrietta Maria, whom he had married by proxy six weeks earlier. At first he was the mere tool of his dashing favorite, George Villiers, Duke of Buckingham. After the assassination of that noble, in 1628, Charles gradually submitted himself to the guidance of his wife, brought up at the court of an absolute monarch and distrusted by the people because she was a Catholic. Her influence, and that of other evil advisers, such as the Duke of Strafford and Archbishop Laud, was largely responsible for confirming the King in the course of action that led to his war with Parliament.

The issue was primarily whether the king of England was an absolute king, like the sovereigns of

CHARLES I TAKING A HOLIDAY TRIP ON THE THAMES

Charles I of England was one of those men who find relief from political or business worries in the tenderness of their family relations. As king his insistence upon outworn rights brought revolt and his own execution. But when he took his family boating on the Thames, he was the most lovable of men. If he could have governed his kingdom as he cared for his family he would have lived in history as one of the best kings England ever had.

continental Europe, or whether his power in levying taxes, making laws, and the like, was limited by the powers of Parliament. Complicated with this, there was also a quarrel about religion. Many of Charles' subjects, known as "Puritans," wished to "purify" the church services by dropping out many ceremonies used by Roman Catholics. Charles on the contrary wished to retain as many as possible of the old ceremonies. He even went so far that he made people fear that he wished to restore Catholicism. Consequently Charles was opposed both for religious and political reasons.

In the first four years of his reign Charles dissolved three Parliaments because they resisted his arbitrary measures. Then for 11 years he ruled without summoning a Parliament. His attempt to make the inland counties pay a "ship-money" tax was met by the resistance of courageous John Hampden, and aroused the greatest excitement. The foolish attempt to force the Scottish church to use English forms of worship arrayed his whole northern kingdom in arms against him also. Charles was thus at last compelled to summon a Parliament (1640) which won fame as the Long Parliament.

This assembly compelled the king to sign laws doing away with all the extraordinary courts and illegal practices which had endangered liberty; he was even forced to sign the death warrant of his counselor Strafford. But Parliament split over the religious question, for some members wished to abolish bishops entirely while others did not. Civil war broke out (1642) when Charles attempted to arrest five leading members of Parliament. Most of the nobility, gentry, and clergy rallied to the King's party; but Parliament controlled London, the navy, and the taxing power of government.

CHARLES II COMES INTO HIS OWN AT LAST

What a happy time it must have been for Charles II when, after years of exile, he received the call to take his father's throne, and landed on the shores of England! It was an equally happy time for the Royalists, who while the Puritans had ruled the land had suffered penalties at the hands of Cromwell and the Commonwealth men. This picture of the greeting given Charles upon his landing at Dover shows the joy which most Englishmen felt over his return.

Charles' dashing "Cavaliers" fought bravely; but the stern Puritan "Roundheads," aided by the Scots, and under the leadership of Oliver Cromwell, were finally victorious. The battle of Marston Moor (July 2, 1643) gave Parliament the north of England as well as the south; and Naseby (June 14, 1645) completed the king's overthrow.

Charles surrendered to the Scots' army, who presently handed him over to Parliament. His escape and a brief Second Civil War (1648) sealed his fate. Parliament decided that there would be no security for the liberty of Englishmen until "Charles Stuart, that man of blood" was dead. It accordingly caused him to be tried, condemned, and beheaded (1649) as "a tyrant, traitor, murderer, and public enemy." Charles met his fate with dignity and composure. "Nothing in his life became him like the leaving of it." So striking was his bearing that one of his foes, the Puritan poet Andrew Marvell, wrote:

> He nothing common did, or mean,
> Upon that memorable scene,
> But bowed his stately head
> Down as upon a bed.

Charles' faults were as a ruler. As a man, a husband, and a father, his record is spotless. It has been well said of him: "No man so good was ever so bad a king."

A Charming but Worthless King

Charles II, 1660–1685, was the shrewder but morally worthless elder son of Charles I. When his father was beheaded in 1649, the younger Charles was 19 years old and safe in France. The royalists of Scotland at once summoned him to be their king, and in 1650 he landed in that kingdom, was crowned at Scone, and with 10,000 Scots marched into England. There he was defeated and his army put to rout by Cromwell, at Worcester. For six weeks Charles wandered about, a fugitive with a price of £1,000 set on his head, now hiding in an oak tree and anon disguised as a serving man. More than 40 persons shared his secret, yet not one betrayed him; and after countless adventures he escaped once more to France. After ten years more of exile, during which Cromwellians and Commonwealth men ruled the British Isles, Charles II was recalled, some time after Cromwell's death, to the thrones of his father.

Charles II was not an admirable character, but he was an interesting one. Utterly selfish, he had an easy good nature and charm of manner that captivated everyone who came in contact with him. One of his courtiers once said that "he never said a foolish thing or did a wise one." Charles' reply was that his acts were those of his ministers, but his words were his own. A constant talker, he was well read, a patron of the drama, of painting, and of architecture. He was much interested in science and actually performed chemical experiments himself. But the license which prevailed at the court of this "Merry Monarch" became a scandal to more than the old Puritan party.

He Follows a "Crooked Course"

Charles' one purpose all through his reign was to make himself an absolute monarch like his contemporary, Louis XIV of France. This led him to try to raise a standing army, to restore Catholicism, and to secure a close alliance with Louis XIV, to whom he looked for money and (in case of need) for troops. But this policy brought him into conflict with his old and loyal counselor Lord Clarendon (earlier Edward Hyde), and Charles heartlessly allowed the "Cavalier" Parliament to impeach Clarendon and force him into exile. Charles followed a crooked course, bribing, and flattering Parliament. But he was fully resolved "never to set forth on his wanderings again," and yielded whenever opposition proved too strong.

During his reign occurred the great plague in London, when nearly 70,000 citizens died; and the great fire in that metropolis, which burned 13,200 houses. Also there took place two wars with the Dutch; but Parliament finally compelled Charles to make peace with this Protestant power. England retained New Amsterdam, taken from the Dutch in America, naming it "New York" after Charles' brother James, Duke of York. Perhaps the most important development of Charles' reign was the beginning of the modern party system. Charles, through one of his supporters, was the first to organize a Government "machine," while his opponents put on a permanent footing one of the two great modern political parties, known for many years after as the "Whig" party.

During the last five years of his reign Charles attained a great degree of success in all his policies. He prevented Parliament from excluding his Catholic brother James from the succession to the throne, and he himself on his deathbed was received into the Church of Rome. But James II proved incapable of using the advantages won by his cynical brother, and the net result of Charles' reign was to leave both England and Scotland more determined than ever before to remain Protestant and politically free. (*See* James, Kings of England and Scotland.)

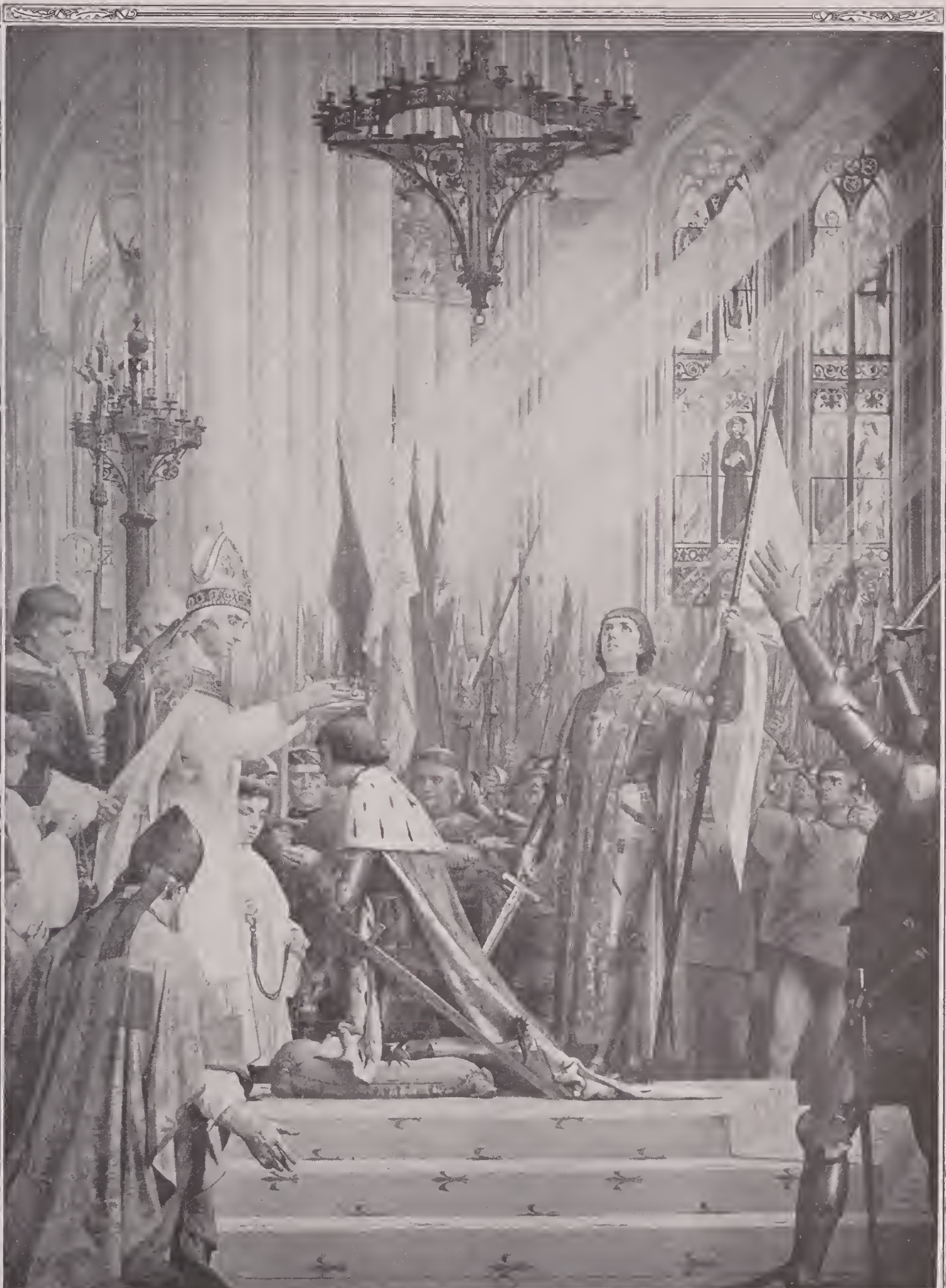
CHARLES, KINGS OF FRANCE. Charlemagne or "Charles (Karl) the Great" was the first Charles to rule over France, but his reign belongs rather to the history of western Europe than to that of any one of the separate kingdoms. So Charlemagne's grandson, Charles the Bald, who received the western part of his father's empire, is called Charles I of France, 843–877. He had nine successors bearing this name, of whom the first four (Charles II, the Fat, 885–887; Charles III, the Simple, 893–922; Charles IV, the Fair, 1322–1328) may be passed with bare mention.

CHARLES V, who ruled 1364–1380, is known by the surname "the Wise." He was a great statesman because he was a good judge of men to carry out his plans, and of times when his plans should be attempted. His reign saw the beginning of the second period of the Hundred Years' War, and although not himself a good warrior, owing to feebleness of body, he yet succeeded in driving England almost completely out of France, largely owing to his choice of Bertrand Du Guesclin as his general. This was a great benefit to his country, for it gave the nation a breathing-space in which to build up her resources.

CHARLES VI, 1380–1422, was a most unfortunate son of a fortunate father. During his minority the land was distracted by the quarrels of his uncles, the brothers of Charles V; and when he attained manhood he almost immediately became insane, with only rare lucid intervals. Again there were struggles for control of the government marked by the assassination, first, of the king's brother (the Duke of Orleans) by his uncle (the Duke of Burgundy). Then, when the latter was killed by the Orleanists (in 1419), there burst forth the furious civil war of the Armagnacs (Orleanists) and the Burgundians. In the midst of this disorder came the renewal of the Hundred Years' War, in 1415, and the victory of England's hero king Henry V at Agincourt. A marriage followed of the young English king to Charles' daughter Katherine. The death of both King Charles and King Henry in 1422 found the whole north of France in the hands of the English, while the Dauphin, later Charles VII, retained a feeble hold in the south.

CHARLES VII, 1422–1461, was not able to be crowned king until 1429, seven years after the death of his father—and then he owed his crown to the courage, faith, and enthusiasm of the simple peasant maid,

JOAN OF ARC AT THE CORONATION OF CHARLES VII



Who does not thrill at the story of how the simple peasant maid Joan of Arc led the French to victory over the English and restored France to its rightful king, Charles VII? Here she stands, beholding the fulfilment of her dreams as the crown of France is placed on the head of Charles in Reims cathedral. Although she was captured shortly after and burned at the stake by the English, her work lived, for Charles proved a better king than was expected.

Joan of Arc (*see* Joan of Arc). After a series of brilliant successes in the field, she was able to lead Charles to Reims for coronation in the cathedral where his ancestors had been crowned. The greatest blot on the fame of Charles VII is that after Joan had saved the throne for him, he made no effort to save her when she fell into the hands of the English and was burned at the stake as a heretic. Her influence, however, lived after her; and before the end of his reign, the English were driven from all France, except Calais, and the Hundred Years' War was at an end. Charles VII is sometimes given the title of "the Victorious," but "the Well-Served" better describes this king.

In administration Charles VII proved strong. By a series of reforms he gave to the crown a standing army with improved artillery—for cannon were now in use—and a permanent source of income; and at the end of his reign the king of France was in a stronger position than he had been at the end of that of Charles V.

Charles VIII, 1483–1498, was a feeble insignificant-appearing successor to Louis XI (1461–1485), that cold cunning Renaissance ruler who had succeeded his father Charles VII and done so much to repair the ravages of the Hundred Years' War. For a time Charles VIII followed the advice of his elder sister, Anne of Beaujeu, of whom her cynical father had once said: "There is no such thing as a wise woman, but Anne is the least foolish woman in the world!" Charles VIII, however, was an impractical dreamer, who planned first the conquest of Italy and then a mighty expedition against the Turks at Constantinople. His claim in Italy was to the throne of Naples, and was an old one inherited from the house of Anjou. At first success attended his expedition into Italy in 1494. The people of Florence drove out their rulers, the Medici, and welcomed Charles to their city. He entered the holy city of Rome, and even Naples speedily fell into his hands. But he and his troops were demoralized by the luxury of the South, and when his enemies in Italy formed a combination against him, he was glad to escape from the country he had hoped to conquer.

Spain speedily appeared as the chief opponent to the French claims in Italy, and the wars dragged on for over 50 years. France gained no new territory, but Charles and his successors brought back a taste for the art and learning of Italy and the Renaissance passed to the north of the Alps. Charles died from striking his head against a low doorway, while riding in pursuit of a girl who had taken his fancy.

CHARLES IX OF FRANCE

Persuaded by his mother, Catherine de' Medici, Charles IX ordered the massacre of the Huguenots, on St. Bartholomew's night, 1572.

Charles IX, 1560–1574, came in the midst of the Reformation and the Wars of the Huguenots in France. The crimes which mar the history of his reign are not entirely the fault of this weak king, but are due mainly to his ambitious mother Catherine de' Medici (*see* Medici). When Charles IX came to the throne he was only ten years old, and it was under his mother that the religious wars began which devastated France for a generation. To her also must be attributed the chief blame for the massacre of St. Bartholomew's Day to which she persuaded her weak and cowardly son in order that she might hide her part in the attempted murder of Coligny (*see* Coligny, Gaspard de).

THE LAST OF THE BOURBONS

Charles X, the last French ruler of the Bourbon house, tried to undo the work of the French Revolution and lost his throne in consequence.

Charles X, 1824–1830, belongs to a much later day, but something of the ill-fame which attaches to the name is his also. He was a belated man of the Middle Ages who—even after the French Revolution—believed in the "divine right of kings," and even declared that he could heal the sick by the touch of his royal hand. His one ambition was to "restore the clergy to its former high position in the state, to create a powerful aristocracy, and to surround it with privileges." The fulfilment of this ambition would mean the loss by the people of even such remnants of liberty as remained to them from the Revolution, so they refused tamely to submit. When Charles endeavored arbitrarily to change the laws and to deprive the people of the freedom of the press, they rose in revolution in Paris a second time. As a result of the "three glorious days," July 26–28, 1830, Charles X fled to England, and the Bourbon kings ceased forever to rule in France.

CHARLES THE BOLD, Duke of Burgundy (1433–1477). By the side of a little stream in northwestern France, on a Sunday morning in October 1468, the fiery ambitious Charles the Bold, Duke of Burgundy, awaited the arrival of his crafty overlord, the miserly king Louis XI of France. At the approach of the royal party, Charles bowed low in his saddle and was about to dismount, but the king prevented him. Fervent were the kisses pressed by the royal lips upon the ducal cheek, while Louis' arm rested lovingly about Charles' neck. In their youth, before Louis became king, the two had been bosom companions, had lived in the same tent, and slept in the same bed.

No one would guess from their meeting that they were no longer friends but bitter enemies, that for three years Charles had been ravaging the territory of the king and encouraging the other nobles of France to resist their sovereign's authority. King Louis had now come to Charles, not as a real friend, but to win back by diplomacy territories which force had compelled him to give up.

Before he had succeeded, alarming reports reached Charles that the citizens of Liége had revolted against him and had killed his officers. He well knew that they had been stirred up by the tricky king, who was known in all the courts of Europe as the "universal spider." For a time the angry duke was ready to murder his royal guest, who was virtually his prisoner. But he had promised Louis that he should be safe in Burgundian territory, and the fiery duke kept his word. Yet he forced the king to accompany him on his expedition against Liége, and to sit by while its walls were destroyed and its citizens suffered death or exile for trusting to his promise of aid.

Charles was ambitious as well as impetuous. He planned to build out of his scattered hereditary possessions, including the Netherlands, a strong state between France and Germany, over which he should rule as king. These ambitions finally led him away from his struggle against the French king and turned all his attention eastward. He easily mastered the pleasant duchy of Lorraine, but his conquests in Alsace brought him into conflict with the sturdy mountaineers of Switzerland. With pikes made by lashing scythes to alpenstocks, the Swiss more than a century and half before had withstood the Hapsburg power; and their bands of serried pikemen were now invincible against feudal cavalry. Charles basely slaughtered the inhabitants of the little town of Granson after its surrender on terms. In return the Swiss administered a defeat near that city (March 1, 1476) in which the Burgundians lost "all their artillery and a vast number of tents and pavilions, besides a great deal of valuable plunder, for they saved nothing but their lives." A few months later (June 21, 1476) the Swiss cut to pieces at Morat a second army raised by the haughty duke.

Then came the mortifying news of the revolt of the town of Nancy, which he had conquered the year before. Charles hastened into Lorraine to put down the insurrection. Against the advice of his councilors he attacked the enemy, but his horsemen were no match for the intrepid Swiss pikemen, who had come to Nancy's aid. The battle (Jan. 5, 1477) was short, for the Burgundians fled before the charging pikemen. When the conflict was over Charles the Bold could not be found. Three days later, on the desolate battlefield, a naked and disfigured body was identified as that of the duke who at one time had been the head of the most magnificent court in Europe.

When Charles the Bold inherited the French duchy of Burgundy from his father, Philip the Good, in 1468, his territory included also the "free" or imperial county of Burgundy (Franche Comté) and most of what we call the Netherlands (now Belgium and Holland). His lands were divided, however, and his aim in his wars was to gain territory which should unite the northern and southern sections. In this he failed, and at his death Louis XI deprived his daughter and heiress, Mary of Burgundy, of all her French possessions. The remainder passed to the House of Hapsburg when Mary married Maximilian of Austria.

The term "Burgundy" has not always meant the same territory. There were at different times in the Middle Ages five different kingdoms of Burgundy, most of them including the valley of the Rhone River, which was never a part of Charles' possessions.

CHARLES MARTEL′ (688–741). By the year 732, exactly 100 years after Mohammed's death, the flood-tide of the Saracen armies had swept west from Arabia across northern Africa, had conquered Spain, and was rolling irresistibly northward through France. The sword of Islam was striving to convert the world to Mohammedanism by the effective method of exterminating unbelievers. Sixteen years before, the Saracen hordes, sweeping northward at the eastern end of the Mediterranean, had been stayed at Constantinople, and Christendom had withstood unshaken the first great hammer-blow of the Moslem power. Now the fate of Europe again hung in the balance, as the green banner of the Prophet stood before Tours, within striking distance of Paris.

The defeated leaders of Southern Gaul were sending up a despairing cry for help. Suddenly out of the North a Frankish host headed by Charles, mayor of the palace for the Merovingian puppet-king at Cologne, fell upon the invaders between Poitiers and Tours. A terrible battle followed. The wild riders of the desert dashed hour after hour in ceaseless charges against the solidly compacted infantry of the North; they came on like the leaping waves of the ocean, to be scattered backward like its spray. The folds of the eastern turban afforded slight protection against the huge swords wielded by the stalwart arms of the Frankish veterans, while the scimitars of Damascus glanced harmlessly from the stout helmets of steel and thick leather corselets of the Franks. Finally the Moslem chief was killed and the foe was sent flying back to the Pyrenees. Europe was again saved to Christianity and Charles had earned his title "Martel" (the Hammer).

Charles Martel, as conqueror and virtual ruler of the entire Frankish kingdom—though he never assumed the crown—prepared the way for his son, Pepin the Short, to gain the throne. Together they laid the foundation for the future world power of Pepin's son, Charles the Great (Charlemagne).

CHARLES XII, KING OF SWEDEN (1682–1718). "Again a child in years sat upon Sweden's throne. A lad of 15 became an all-commanding Sovereign King responsible for his actions to none on earth, but with power and authority as a Christian king to rule and govern his realm as it seemed best to him." So wrote one of the followers of this king who made himself his chronicler.

"THE LION OF THE NORTH"

Charles XII of Sweden earned his title to fame by his great military abilities, but his wars reduced his country from a world power to a second-rate state. Here he is represented in a French wig and armor.

We cannot help feeling sorry for this muscular, gaunt, lanky boy, whose youthful pranks frequently scandalized the people of Stockholm. Without father or mother to advise him, it was a heavy task he had to face when he became king in 1697. The nobles of his land wished to regain the power taken from them by his father Charles XI, and a circle of jealous enemies—the kings of Russia, Poland, and Denmark—were plotting to take from him his land on the other side of the Baltic, which formed part of the powerful kingdom built up by his great-great-uncle Gustavus Adolphus.

For a time the boy king proved equal to the task. The nobles soon found that they could gain no concessions from him, and he even refused to take the usual coronation oath and announced that he ruled by divine right. As he had no desire to marry, the matchmakers of Europe who sought his alliance for their countries finally left his court in despair. And when in 1699 his enemies of Russia, Poland, and Denmark began the Great Northern War, he fell on them separately with a skill and fury that gained for him the title of one of the greatest generals in history.

As by the wand of a magician the boy became a man; his pranks gave way to a serious earnest work. War had become his handicraft and trade, for Charles was a natural military leader of the highest ability. One of his soldiers tells us that though his men "were bloody, spent, and gashed, home and friends, pain and fear, were all forgotten by them in their campaigns. Though they were destitute and starving, too weak to stand, again and again their swords leaped from their scabbards and they sprang to new effort at the magic of his call."

Turning his attention first to Denmark, Charles swooped down on that country where he was least expected, and after a short but bloody war he forced her treacherous king to make peace.

While Charles was thus engaged, Peter the Great, Czar of Russia, was attacking Sweden's provinces on the eastern shores of the Baltic. Without giving his men rest or respite, Charles immediately set out for the besieged city of Narva. To attack this seemed foolhardy, for Charles had less than 8,000 men, while the Russians numbered 48,000. In spite of this handicap, in a short time the untrained Russians were in wild flight, leaving all their supplies behind.

His Victories and Fatal Obstinacy

In one way this battle of Narva, often called the most glorious engagement of Swedish arms, was a bad thing, for after it Charles refused to listen to any talk of peace. The good-natured youth had become a severe reserved soldier, who disregarded all advice contrary to his own desires. His reckless ambition and fatal obstinacy finally grew to such a pitch as to gain for him the name of "Madman of the North."

From Narva Charles invaded Poland, whose king also had attacked his territories. At the end of five years Charles was completely victorious and placed a king of his own choosing on the Polish throne. But meanwhile Peter the Great had conquered the Swedish provinces about the Gulf of Finland.

Charles now (1707) invaded Russia and this proved his undoing as it proved that of Napoleon a hundred years later. The Russians used the same tactics in both cases, refusing to fight and retreating into the interior. Failing to capture Moscow, Charles lay siege to the fortified city of Poltava, nearly 800 miles from the Baltic, in southern Russia. To the advice that he retreat while there was yet opportunity, he replied, "If an angel should descend from heaven and order me to depart from here, I would not go." In the end the Swedes soon found themselves outnumbered two to one by the well-organized army of Peter the Great. In the battle which followed Charles' army was defeated and almost entirely destroyed, and he himself escaped with difficulty to Turkish soil.

Death of "The Lion of the North"

When the Sultan refused to aid him against Russia, Charles behaved like one insane. At last he was ordered to leave Turkey, and with but two companions he returned through hostile lands to his own country. He found his outlying possessions almost entirely lost, and the Swedish power in ruins.

Four years later, while foolishly attempting the conquest of Norway, his adventurous life was ended at the siege of the petty fortress of Friedrichshall. The Lion of the North was gone, but not until he had brought Sweden down from one of the great powers of Europe to the rank of a second-rate state, from which it has never since been able to rise.

Of other Swedish kings named Charles, we can only mention Charles IX, 1600–1611, the father of Gustavus Adolphus; Charles X, 1654–1660, nephew of the great Gustavus; Charles XI, 1660–1697, son of the preceding and father of Charles XII; and Charles XV, 1859–1872, the last of that name.

CHARLESTON, S. C. Since its founding in 1670 as an English settlement, Charleston, the chief city of South Carolina, has had a rich and varied history. It was the first Southern city to join the Revolutionary movement; and the Civil War was begun, in April 1861, by the bombardment and capture of Fort Sumter, in its harbor (*see* Fort Sumter).

Charleston is situated 7½ miles from the ocean, on a peninsula formed by the Ashley and Cooper rivers. Their estuary forms a magnificent landlocked harbor six miles long and three miles wide—one of the largest and safest on the Atlantic coast. The city has about 26 miles of available waterfront.

Charleston has long been an important naval and military point. It has the only United States navy yard from Cape Hatteras to the mouth of the Rio Grande, and it is also the only place on the South Atlantic or Gulf coast with a drydock large enough to repair a battleship. When the United States entered the World War in 1917, Charleston became the headquarters of the southeastern military department and of the sixth naval district.

Before the Civil War the export trade in cotton, rice, and naval stores was very considerable, but that war reduced it to almost nothing. Only since the beginning of the 20th century has Charleston really recovered from her losses of the Civil War period.

The principal exports today are coal, cotton, cotton goods, lumber, fertilizers, cigars and tobacco, fruits, and vegetables. Charleston has the only large coaling terminals of the South Atlantic states, and the recent construction of two large fuel oil tanks, with a capacity of 700,000 gallons each, has made it the most important supply and distributing point for oil between Baltimore and New Orleans. The chief manufactured products are fertilizers, lumber, and textiles. Other important industries are asbestos, cigars, overalls, iron foundries, printing and publishing establishments, and medicines. In addition Charleston is an important wholesale distributing point. Charleston's water-borne commerce totals about $400,000,000 annually.

Charleston has a number of buildings dating back to Colonial days, and many places of historical interest carefully preserved. These include the old post-office building where Washington and Lafayette were entertained, the old slave market, the Huger residence, in which Lord William Campbell, the last colonial governor of South Carolina, resided, and many others. There are many beautiful parks and gardens scattered throughout the city. The municipal College of Charleston, chartered in 1785, is the principal institution of higher education. The Military College of South Carolina, a state institution founded in 1845, is one of the foremost military schools of the country.

The earliest settlement of Charleston—named in honor of the English King Charles II—was on the Ashley River, opposite the present site. A band of French Huguenot refugees joined the colony in 1685. Thomas Quincy in Boston wrote of Charleston, in 1774, that it was "the most beautiful and in many ways the most magnificent" city in North America.

Fort Sullivan, later renamed Fort Moultrie in honor of General William Moultrie, was built on Sullivan's Island at the entrance to the harbor in 1776, and successfully resisted attack until 1780.

The British captured the town in 1780, and it was not reoccupied by the American forces until 1782. In 1783 Charleston was incorporated as a city, and from that time until 1790 it was the capital of the state of South Carolina. The convention which proclaimed the state's secession from the Union met here on Dec. 28, 1860. After the taking of Fort Sumter by the Confederates, it was almost continually besieged by the Union forces and fleets, 1862–65. In 1886 an earthquake killed scores of people and caused a property damage of $8,000,000. Population, about 70,000.

CHÂTEAU-THIERRY (*shȧ-tō' tyĕ-rē'*), FRANCE. As long as the history of the World War of 1914–18 lives the name of Château-Thierry will call to mind the most critical period of that vast conflict, the months of June and July, 1918, when the power of Germany spent itself in a last vain drive for Paris, and the Allies began the eastward march which was to end beyond the banks of the Rhine.

Château-Thierry lies on the River Marne, 47 miles in a straight line east and slightly north of Paris. With Reims, 32 miles farther east on the Vesle River, and Soissons, 23 miles to the north on the Aisne, Château-Thierry forms a great triangle commanding the railway and river approaches to Paris.

Into this triangle the Germans had thrust their forces on May 27, taking Soissons and occupying Château-Thierry on June 1. How they were later caught on the north flank by the French and American troops, and forced to a hasty retreat, is told elsewhere. (*See* Marne River; World War of 1914–18.)

The first telling stroke was delivered by the 7th machine gun battalion of the Third Division of the American army, which had been rushed in by motor cars to aid the weary French troops. It arrived in time to hold the Château-Thierry bridge over the Marne, and the word was cabled to all parts of the world that the Americans had saved Paris. The Marines and "regulars" of the Second Division three days later (June 6) began that brilliant action in Belleau Wood, northwest of Château-Thierry, which brought them such great renown. After a lull of several weeks, American troops about Château-Thierry entered in the general counter-attack which swept the Germans out of the triangle.

Château-Thierry today is a small city of about 12,000 people. Its inhabitants inherit from their ancestors a faculty for repairing the ravages of war, for ever since the 15th century their little town has been sacked and destroyed every hundred years or so. The poet La Fontaine was born there in 1621. On the top of a nearby hill are the ruins of a castle, said to have been built by Charles Martel for the Frankish king Thierry IV, from which the town received its name.

CHATHAM (*chăt'ăm*), **WILLIAM PITT, EARL OF** (1708–1778). "I know that I can save the country and that no one else can," proudly boasted William Pitt the Elder, in 1757, when England was losing battle after battle in the great Seven Years' War.

What reasons, you ask, had Pitt for making such a seemingly arrogant statement? He did not belong to the great noble families of England which had long governed that country. He had studied for a time at Eaton and Oxford, but had been obliged to leave the university before he obtained his degree because of his life-long enemy—gout. He had served for a time in the army. Then in 1735 he had entered Parliament for the "pocket borough" of Old Sarum, which the Pitt family owned.

Here he soon won notice for his opposition to the governing clique then in power. He possessed ability, determination, patriotism, and eloquence, and was finally given a minor office. This was against the wishes of George II, whom Pitt had angered by his course. Now the statesman tried to win the favor of his royal master. One of his enemies declared he bowed so low before the king that his crooked nose showed between his legs.

But it was the favor of the people and not of the king which elevated Pitt to the position he coveted. As paymaster-general he had won the public confidence by refusing to accept anything beyond the salary attached to the office. As a result, when things went badly at the beginning of the war the people demanded Pitt so loudly that the king was at last obliged to yield.

"Sire, give me your confidence," said Pitt when he assumed the office of prime minister, "and I will deserve it." "Deserve my confidence," replied the king, "and you shall have it." On both sides the promise was fully kept. Pitt put his whole heart into his work, and soon stirred up all departments of the government to great activity. He appointed officers in the navy and army not for favor or because of their family connections, but solely on account of their ability. He sent Gen. James Wolfe to Canada and won that vast empire for Great Britain. He encouraged Clive in India, and sent aid to England's ally on the Continent, Frederick the Great of Prussia.

Before the war was over George II was succeeded by his grandson, George III, who was resolved to "be king." He undermined Pitt's influence over the cabinet, and as a result Pitt resigned in 1761.

The episode in Pitt's life best known to Americans occurred a few years after this, in 1766, when as a private member of the House of Commons he upheld the American colonists in their opposition to the Stamp Act, and "rejoiced that Americans had resisted." Would American history have been different if Pitt had still possessed his old ability in 1766, when he again became prime minister? It is hard to tell, for at that time he was suffering so from the gout and from a nervous disorder that for many critical months he left all to subordinates.

Pitt's period of greatness was past. He had lost support among the people by his acceptance of the title of Earl of Chatham, in 1766, and his transfer to the House of Lords removed him from the larger arena of the Commons. He was even too feeble to appear often before that small body. His last speech was in 1778, when he opposed a motion to make peace with America upon terms of independence, protesting against the loss of this great section of the empire and the implied humiliation before France, England's hereditary foe and America's ally. At the end of that speech he collapsed and was carried to his home, where he died a few weeks later.

The Great Commoner was one of the most powerful ministers England ever had. True, he was at times overbearing and his language bombastic; but he built up the British Empire and he made Britain respected at home and abroad. He was among the greatest figures in English history. Says an English historian: "He had not merely done great things—he had inspired England with confidence in herself."

Chatham's younger son, also named William Pitt, won even greater fame for his statesmanship in the trying days of the French Revolution and the Napoleonic Wars. (*See* Pitt, William, the Younger.)

CHATTANOOGA, BATTLE OF. As a dramatic climax to the conflict around Chattanooga, Tenn., occurred the battles of Lookout Mountain and Missionary Ridge, Nov. 25, 1863. It was one of the most important Union victories of the Civil War, since it opened the way for Sherman's campaign into Georgia and his famous "march to the sea."

After their disastrous defeat at Chickamauga (Sept. 19–20, 1863—*see* Thomas, Gen. George H.) the Federal troops under Rosecrans had withdrawn to Chattanooga, determined to hold that place at all costs. General Thomas had been appointed to the command in place of the discredited Rosecrans, and Generals Grant and Sherman had hurried to his aid. In the conflict which followed, these three great generals of the North fought side by side.

When the conflict began the Union commanders had 56,000 men to 46,000 Confederates. But the inequality of numbers was balanced by the better positions held by the latter, for they were entrenched on the heights of Lookout Mountain and Missionary Ridge, and held the valley between the two. These ridges approach to within a few miles of Chattanooga on the south and extend into northwestern Georgia. To capture the Confederate positions the Union troops had to scale the heights in the face of a murderous fire.

On the day set for the attack on Lookout Mountain the weather aided the North. Low-lying mists filled the valley and hid from sight the Union troops until they had almost reached the summit. Then in a battle romantically known as "the Battle above the Clouds" they drove the Confederates from their positions and won the day. General Bragg, the Confederate commander, withdrew his troops to Missionary Ridge. On the next day, the attack was made on the latter position. Sherman's men made the first assault on the northern base. Desperate fighting ensued, the Confederate lines being stubbornly held against Sherman's repeated attacks. In the afternoon General Grant ordered Hooker's men to assist by capturing the rifle-pits at the western base of the ridge. This proved an easy task. Without waiting for further orders, the men then rushed up the slope and drove the Confederates from the height.

The day was won. Chattanooga was saved and the Confederates were driven out of Tennessee. The news of this great victory reached the North on the last Thursday in November, making possible the first real Thanksgiving since the outbreak of the war.

The city of Chattanooga, which had a population of between 2,000 and 3,000 at the time of the Civil War, is today one of the leading industrial and commercial cities of Tennessee. The many lines of railroad which radiate from it and the nearby deposits of coal and iron and vast potential water-power resources give it a great and growing importance in manufacturing. Population, about 60,000.

The MORNING STAR *of* ENGLISH POETRY

The Prioress

CHAU'CER, GEOFFREY (about 1340–1400). On a fresh April morning in the merry England of centuries ago, a goodly company of men and women are gathered in the old Tabard Inn at Southwark, a suburb of London. They are the Canterbury Pilgrims of whom Chaucer tells us in his delightful 'Canterbury Tales'—a group of wayfarers bound for the shrine of the martyr Thomas Becket. Most of them are in holiday dress, and the spirit of adventure and merriment is in the air; for such a pilgrimage was a favorite devotion and diversion of the time.

And the Knight

Above the talk and laughter of the guests we hear the voice of the jolly host of the Tabard:

> My masters, certainly
> Ye be to me right welcome, heartily:
> For by my troth, and flattering none, say I,
> I have not seen so large a company
> At once inside my inn this year, as now.
> I'd gladly make you mirth if I knew how.
> And of a pleasant game I'm just bethought
> To cheer the journey—it shall cost you nought.

And he goes on to propose that, instead of riding "dumb as a stone," each shall tell two tales on the way to Canterbury, and two more on the way home; and he who tells the best story shall have a supper at the expense of the rest when they return.

"Ay, ay!" goes up a cry of assent. The next morning the pilgrims make ready to depart. What a mixed company it is! Foremost of all rides the Knight—"a very perfect, gentle Knight"—who has just come from battle against the heathen and whose coat is stained by the armor he has but now laid aside. There is no pomp in his attire or in his bearing, for he is "as meek as is a maid"; his glory is in his good deeds and in his loyalty to the principles of chivalry. By his side is his son, the gay young Squire, who plays the flute or sings the whole day long; and a Yeoman, clad in coat of green, carrying a sheaf of peacock arrows and a mighty bow.

The Clerk

Then there is the Prioress, who speaks French (with an English accent), and is so tender-hearted that she would weep at a mouse caught in a trap; the Monk, who loves hunting more than study; the Friar, "wanton and merry"; the poor Parson, "rich in holy thought and work": and the Clerk (or clergyman) of Oxford, with his threadbare cloak and his horse as "lean as a rake," who would rather have—

> . . . . at his bed's head
> A score of books, all clad in black or red
> Of Aristotle and his philosophy,
> Than rich attire, fiddle, or psaltery.

Almost every profession and occupation is represented, from the Merchant, so important in his bearing that no one would guess that he is in debt, to the hard-working Plowman, who reverences God and loves his neighbor as himself. We must not forget the jolly Wife of Bath, bold and fair and red of face, with her scarlet hose and her hat as broad as a shield. She has already had five husbands and is ready for another, and though she is somewhat deaf and has lost her teeth, her gay talk enlivens the company.

And now we listen to the tales told by this motley gathering: the Knight's Tale of Palamon and Arcite and their love for the fair Emily; the Clerk's story of Patient Griselda, the model of wifely steadfastness; and the Prioress' story of the child-martyr, who even when his throat was cut still raised his voice to the Virgin Mary. The Nun's Priest tells the fanciful animal story of Chauntecler and Pertelote, or the Cock and the Hen. The drunken Miller's story is as coarse as himself. Chaucer has a laugh at his own expense by picturing himself as beginning the dull rhymed tale of Sir Thopas, which so wearies the host that he will not allow him to finish.

There are 24 stories in all. Chaucer planned to have 128, but he died before the great work was finished. Incomplete as it is, the 'Canterbury Tales' remains one of the supreme masterpieces of English literature, brimming over with the joy of living and abounding in humor.

That Chaucer was a busy man of affairs as well as a poet, we know from his writings, as well as from the few facts about his life that have come down to us. He began life as page in the household of one of the royal family. A little later he was with the army of King Edward III in France, and when he was taken prisoner in one of the battles of the great Hundred Years' War, the king himself helped to pay his ransom. Chaucer held several public offices and was sent several times to the continent on diplomatic missions.

ENGLAND'S FIRST GREAT POET

Geoffrey Chaucer's immortal 'Canterbury Tales' are among the most splendid examples of narrative poetry in any language.

Gracious, ready of wit, cheerful and genial, he made friends wherever he went. He was a keen observer and made the best of his rich experience. The development of his genius owed much to French influence. He translated the French 'Roman de la Rose', a typical medieval love story, and in his own earliest poems imitated French models. One of his missions brought him to Italy, which was then Europe's great center of art and learning. Possibly in this sunny land he may have met Petrarch, the poet and humanist, and Boccaccio, the writer of gay tales; at any rate he became acquainted with their writings, and his own work was greatly influenced by them.

In his later years Chaucer's fortunes declined, but he did not lose his cheerful disposition. Half in fun, he wrote a 'Complaint to his Purse!' A pension from the king quickly followed, but he did not live long to enjoy it, for death came within a year. He was buried in Westminster Abbey, and was the first to find a resting place in the famous Poets' Corner.

The Poet of the Springtime

We naturally think of Chaucer as a springtime poet, for he loves to sing of the joyous season when the birds make melody and all nature awakes.

When April hath his sweetest showers brought
To pierce the heart of March and banish drought.
And when the little birds make melody,
That sleep the whole night long with open eye,
So nature rouses instinct into song.

And as springtime suggests the beginning of new life, so Chaucer stands at the beginning of English poetry. Edmund Spenser called him the "well of English undefyled"; and Tennyson, "the morning star of song." He helped to fix the English language and verse-forms in channels which they have ever since followed. To him and to Wyclif, as much as to any others, we owe the form of the language which we speak today. Before Chaucer there was no standard English language. There were three dialects — Northern, Midland, and Southern—and of these he chose the Midland for his immortal work. "He found English a dialect and left it a language." While using a considerable number of Norman-French words, and thus giving grace and smoothness and variety to the rude speech of the people, he still kept close to the language of common life. James Russell Lowell puts it this way: "In him we see the first result of the Norman yeast upon the home-baked Saxon loaf. The flour had been honest, the paste well kneaded, but the inspiring leaven was wanting till the Norman brought it over. Chaucer works still in the solid material of his race, but with what airy lightness has he not infused it?" (*See* English Language.)

In more than one sense Chaucer is "the father of English poetry." His great imagination, his insight and sympathy, and his whole-souled humor have been an inspiration to five centuries of poets.

In the quotations in this article the ancient spellings and words have been modernized, for many of Chaucer's words look very queer to our eyes. He wrote more than 500 years ago, and a language is bound to change a great deal in that time. It is well to begin to read the 'Canterbury Tales' in some good modern version, such as Mrs. H. R. Haweis' 'Chaucer for Children'. But it will not be long before you will want to read the tales just as Chaucer wrote them, and you will find that with a little pains you will have no trouble in understanding them.

Besides the 'Canterbury Tales', Chaucer's chief works are: 'The Romance of the Rose' translated from the French; 'The Book of the Duchess'; 'Troilus and Cressida'; 'The Parliament of Fowls (Birds)'; 'The House of Fame'; 'The Legend of Good Women'.

CHAUCER READING THE FIRST GREAT ENGLISH POEM AT COURT

When Chaucer began to write, the English language was held in little regard by the upper classes. French was still the language of court and castle, and French or Latin were considered the best vehicles for literary expression. Because of his success in revealing the music that lay in the English tongue, Chaucer is sometimes called "the father of modern literary English." The 'Canterbury Tales' were received with delight and we may imagine that their author was often called on to amuse the court of King Edward III by reading a new episode, as the artist Ford Madox Brown here pictures him.

TALES TOLD BY THE CANTERBURY PILGRIMS

The Merry Pilgrims are on the road to Canterbury. The genial Host leads the way, followed by the Knight, the Squire, the Wife of Bath, and the Pardoner.

WHEN the merry company of pilgrims had gone some two miles on their way, they drew lots to see who should tell the first story. Whether by chance or whether the wily host had so arranged it, the Knight drew the shortest lot. All rejoiced at this, and as they jogged along, he began the tale of Palamon and Arcite, two cousins of the royal house of Thebes who had been taken prisoners by Duke Theseus of Athens.

The Knight's Tale of Palamon and Arcite

ONE bright May morning (the Knight said), the lovely Emily, sister-in-law to the Duke, was walking in the royal garden beneath the tower in which Palamon and Arcite were prisoners.

She was fairer than the lily upon its stalk of green, and it would be hard to say which was fresher, the bloom of her cheeks or the color of the rose. She was daintily attired, her yellow hair falling down her back in a long braid. Up and down the garden she wandered, gathering here a white flower and there a red one, to make a garland for her head. And all the while she sang with a voice like an angel's.

Chancing to look through his barred window, Palamon caught sight of beautiful Emily.

"Ah," he cried, pierced to the heart with love. "It is the goddess Venus herself!"

Then Arcite looked out, and he too was smitten with love and cried out:

"Her fresh beauty will slay me! If I cannot have her grace, I am but dead."

Then, for the first time in their lives, the two cousins began to quarrel.

Soon after it came to pass that a friend of Arcite prevailed on Theseus to set him free. Theseus decreed, however, that Arcite must leave Athens at once, and that he should lose his head if he were ever found there again. So Arcite, though free, thought himself less fortunate than Palamon, who remained in prison; for now he could not even look upon Emily from a distance.

The time came when Arcite could bear the pain of absence no longer. Disguising himself as a laborer, he returned to Athens and took service in the household of the duke.

Seven years had passed and Palamon was still pining in prison. At last one night he escaped. In a wood near by he chanced to meet Arcite, and the two rivals at once fell to quarreling again over Emily.

"Either thou or I must die," said Palamon. Arcite promised that the next day he would bring weapons, so that they might fight for the lady whom they both loved.

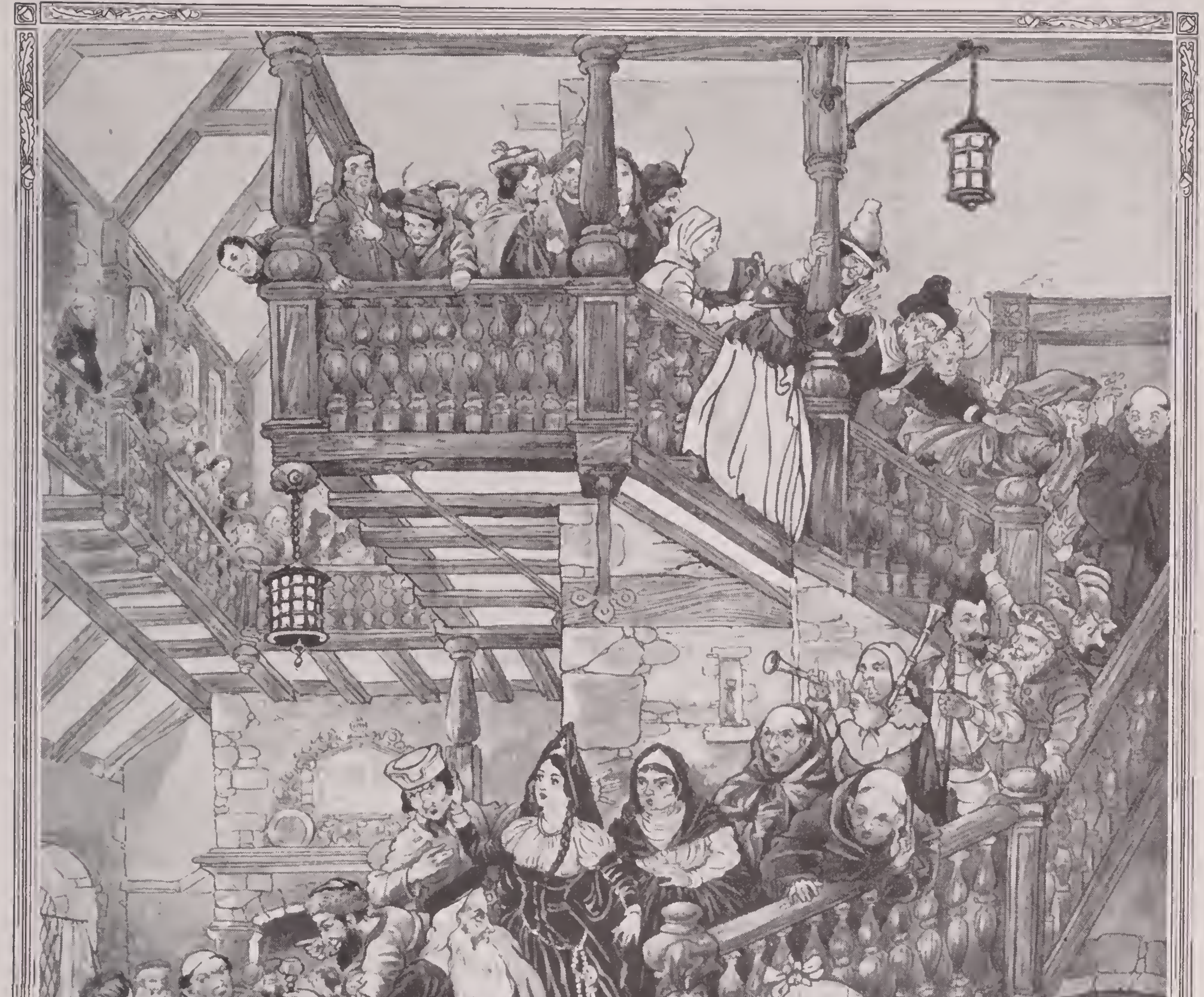
They met as agreed, and while they were fighting fiercely Duke Theseus chanced to come through the wood on his way to the hunt. Queen Hippolyta rode with him, and with her was the lady Emily, clad all in green.

"Hold!" cried the duke, drawing his sword. "No more, on pain of death! Who are you that dare to fight here?" When he heard their story, he cried angrily, "Your own mouths condemn you, and you shall both die."

Then the queen and Emily began to weep. Falling on their knees they begged Duke Theseus not to treat two such gentle youths so cruelly. Relenting, the duke made them this offer. At the end of 50 weeks, Palamon and Arcite should each bring a hundred knights armed for the lists. They would hold a great tournament, and the victor should have Emily for his wife. Both joyfully agreed.

When the great day arrived, both sides fought bravely and well. But before the day was done, Palamon was struck down and taken captive.

CHAUCER'S PILGRIMS AT THE TABARD INN



In Southwark at the Tabard as I lay,
Redy to wenden on my pilgrimage
To Caunterbury with ful devout corage
At night was come into that hostelrye
Wel nyne and twenty in a compainye,
Of sondry folk, by aventure y-falle
In felaweshipe, and pilgryms were thei alle,
That towards Caunterbury wolden ryde;
The chambres and the stables weren wyde,
And wel we weren esed atte beste.

An artist's impression of the Tabard Inn in Southwark, with Chaucer's pilgrims coming down a winding staircase of romantic character. The Doctor, the Wife of Bath, the Miller, the Summoner, the Reeve, and many another figure are to be seen among the throng.

Then Theseus cried out: "Hold! The fight is over. Arcite of Thebes shall have the lady Emily, for he has fairly won her."

But just as Arcite, filled with joy, was riding proudly toward Emily, his horse stumbled and he was thrown heavily against his saddle-bow. His breast was crushed and he was mortally injured. When, in spite of all remedies, Arcite knew that he must die, he sent for the lady Emily and his friend and rival Palamon.

"Alas!" he said, "after all the sorrow I have borne, I must die and leave you, my heart's lady. Raise me gently in your arms, I pray you, and harken unto me. For love of you and from jealousy I have had strife with my dear cousin here for many a day. But to speak truly, there is no man so worthy to be loved of fair lady as he. And if ever you should bethink you to become a wife, forget not my noble Palamon."

His breath then failed him, and murmuring "Emily," the brave knight passed away.

So great was Emily's sorrow that she wept day and night, and could not be comforted. Palamon, too, was bowed down with grief, and all Athens mourned Arcite.

After some time had passed, Palamon and Emily were married. She loved him so tenderly, and he served her so devotedly, that never was there a harsh word between them. And they lived together in health and wealth and happiness long years thereafter.

WHEN several other of the pilgrims had told their stories, merry or sad, the host suddenly turned to the Clerk and said: "Sir Clerk of Oxford, 'tis now your turn. Do not preach a sermon, forsooth, but tell us a goodly tale from the stories of your learning." Smiling, the Clerk replied: "My host, I will tell you a story that I once heard at Padua from a worthy clerk named Francesco Petrarch. He is dead now. God grant peace to his soul!" And so he began the story of the beautiful and virtuous Griselda, the poorest maiden in all the lands ruled by the Marquis Walter, a noble, strong, and courteous lord who had promised his people to take him a wife that a son might be left to rule after him.

The Clerk's Tale of Patient Griselda

THE day set for the wedding (said the Clerk) was at last arrived, and great preparations had been made in the castle. The choicest dainties of the land were brought together for the feast. Costly garments and precious gems were ready to adorn the bride. The wedding guests were arrived, but no one knew as yet whom their lord had chosen to be the bride.

Then the marquis put himself at the head of the wedding party and bade them follow him to the village near by. As they reached the humble dwelling where the poor maiden Griselda lived with her father, she was just bringing a jar of water from the well. The marquis stopped the gay procession and called the maiden by name.

"Griselda," said Lord Walter, "I wish you to become my wife. Will you promise to obey me in all things and never complain whether I give you pleasure or pain?"

The Meekness of Griselda

Trembling, Griselda replied: "My Lord, I am not worthy of this great honor that you offer me. But if this be your will, it is also mine; and I swear that I will die rather than willingly disobey you in thought or deed."

Then the gentlewomen who were with Sir Walter robed her in beautiful garments in place of her poor attire, and placed a golden crown upon her head. The marquis set her upon a snow-white horse by his side and conducted her in state to the palace, where the marriage was celebrated with feasting and joy.

Griselda's kindness and virtue endeared her to all the people and she made her husband very happy. But a foolish thought came to Lord Walter. He longed to put his wife to the test that he might see whether her patience and steadfastness were as great as they seemed. One night, soon after a little daughter had been born to them, he came to his wife, and said:

"Griselda, since your daughter was born my people have been greatly displeased, and I must do with the child as they choose."

"My child and I are yours," said Griselda, simply. "Do with us as you will." And Griselda only begged that she might kiss her baby ere she parted from it forever.

A few years afterwards another child was born—a little boy—and Lord Walter, who wished still to try his wife, told her the people were again displeased at the thought that the grandson of a lowly peasant should become their lord.

Patient as ever, Griselda gave up her little son to her husband, as she had her daughter. And so the years passed.

Not satisfied even yet, the marquis one day said:

"Griselda, my people urge me to take another wife, and I must yield to their wishes."

Griselda bowed submissively before this cruel blow. "My lord," she said, "I have always known that I was never worthy to be your wife or even your servant for so much as a day. I thank God that in my unworthiness you have honored me for so long a time, and I pray Him to grant you happiness. I came to you with nothing at all. Even the poor dress that I wore was stripped from me, and by your grace I was clad in rich garments and jewels.

Now here I give them back to you, with the wedding ring that you placed upon my finger."

And so, clad only in a peasant's smock, her beautiful head and feet all bare, she went forth to her peasant father's dwelling.

When the fair young bride came in state with her brother from Bologna, Lord Walter sent for poor Griselda to come and make the palace ready for the lady he was to marry. Faithful as ever, Griselda came at his bidding.

The Great Surprise at the Wedding Feast

When all the guests were ready for the feast, the marquis called to Griselda and said, in jest, "Griselda, how do you like my new wife?"

"Right well, my lord," she replied. "I never saw a fairer bride. God grant joy to you and her. Only one thing I pray of you. Do not try her heart too sorely, for she has been tenderly brought up and could hardly endure such suffering as has been my lot."

Then the marquis was so moved that he cried out: "This is enough, Griselda mine! Now I know your steadfastness, dear wife." And clasping her in his arms he kissed her again and again.

"This maiden," cried he, "who you thought should be my wife is our own daughter, and the boy beside her is our son. All this while they have been cared for by my sister in Bologna. Not through malice and cruelty have I kept them from you, but that I might know your heart."

Griselda swooned for joy. When she came to her senses she gathered her children in her arms, and tearfully thanked God for saving them and giving back to her her husband's love. She was again dressed in her royal robes and there was great rejoicing.

For many a year thereafter the marquis and his wife lived happily together. The daughter was married to one of the noblest lords in all Italy. Griselda's old father was sent for and kept in comfort till the end of his life. In time Lord Walter's son succeeded to the heritage. He too married happily; but never, forsooth, did he put his wife to such a test as the patient Griselda had suffered.

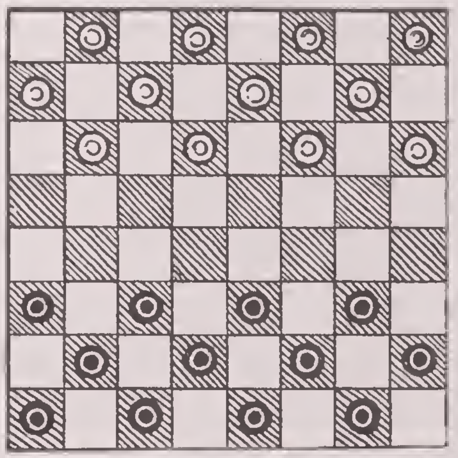
CHAUTAUQUA (*sha-ta'kwa*). In 1874 Bishop John H. Vincent and Lewis Miller started a summer assembly for the instruction of Sunday school teachers. They loacted it at Chautauqua, a popular lake resort in western New York. It grew rapidly into one of the most important and characteristic of American contributions to popular education. No other influence until the rise of university extension did so much to direct the reading of thousands of adults who wanted to supplement their early education.

The movement soon covered the United States and spread to Canada, England, Japan, and South Africa. Special graded courses of study were established in almost a hundred subjects. Simple textbooks were supplied to the 300,000 members of the Chautauqua Literary and Scientific Circle. Diplomas were given at the end of a four years' course.

Besides the parent assembly still held each year in July and August, local Chautauquas with lectures, readings, music, and varied entertainment are now held throughout the country. These local "Chautauquas" are organized and supplied with excellent lecturers and entertainers by bureaus which have nothing to do with the original Chautauqua.

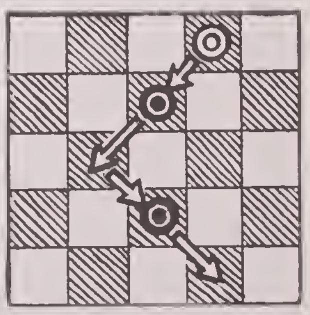
CHECKERS. Battles between "checker men" have interested young and old ever since the first crude game of draughts was played by the Egyptians—probably as early as 1600 B.C. Later the Greeks and Romans enjoyed the game, and more recently there have been French, German, Polish, Dutch, Scotch, and English games of "draughts," the latter being the game called "checkers" in America.

The game is played with small round pieces of wood or bone, arranged in lines of battle on a square board, divided into 64 alternating squares of black and white or black and red. Two players using a set of 12 "men" each direct the combat, which consists in an orderly advance and retreat across the battlefield. The men of one player are colored white (or red), the other black. The object of the game is to capture your opponent's men and remove them from the board.



Here we see the arrangement of the "men" on a checkerboard at the beginning of a game.

The forces are drawn up on the first three rows of the black squares, on opposite sides of the field, as in diagram 1. Each side moves alternately, and the men may only be moved forward diagonally, to the right or left, to the next unoccupied black square. When the adjoining square is occupied by one of the enemy and the square next in line is vacant, the player may "jump" his man over his opponent's piece to the vacant square, and remove the enemy's man from the board. Sometimes two or more jumps can be made by a single move (*see* diagram 2). When a man has penetrated to the last or "king" row of the enemy's line, it becomes a "king" (indicated by placing another checker on top of it). A king can



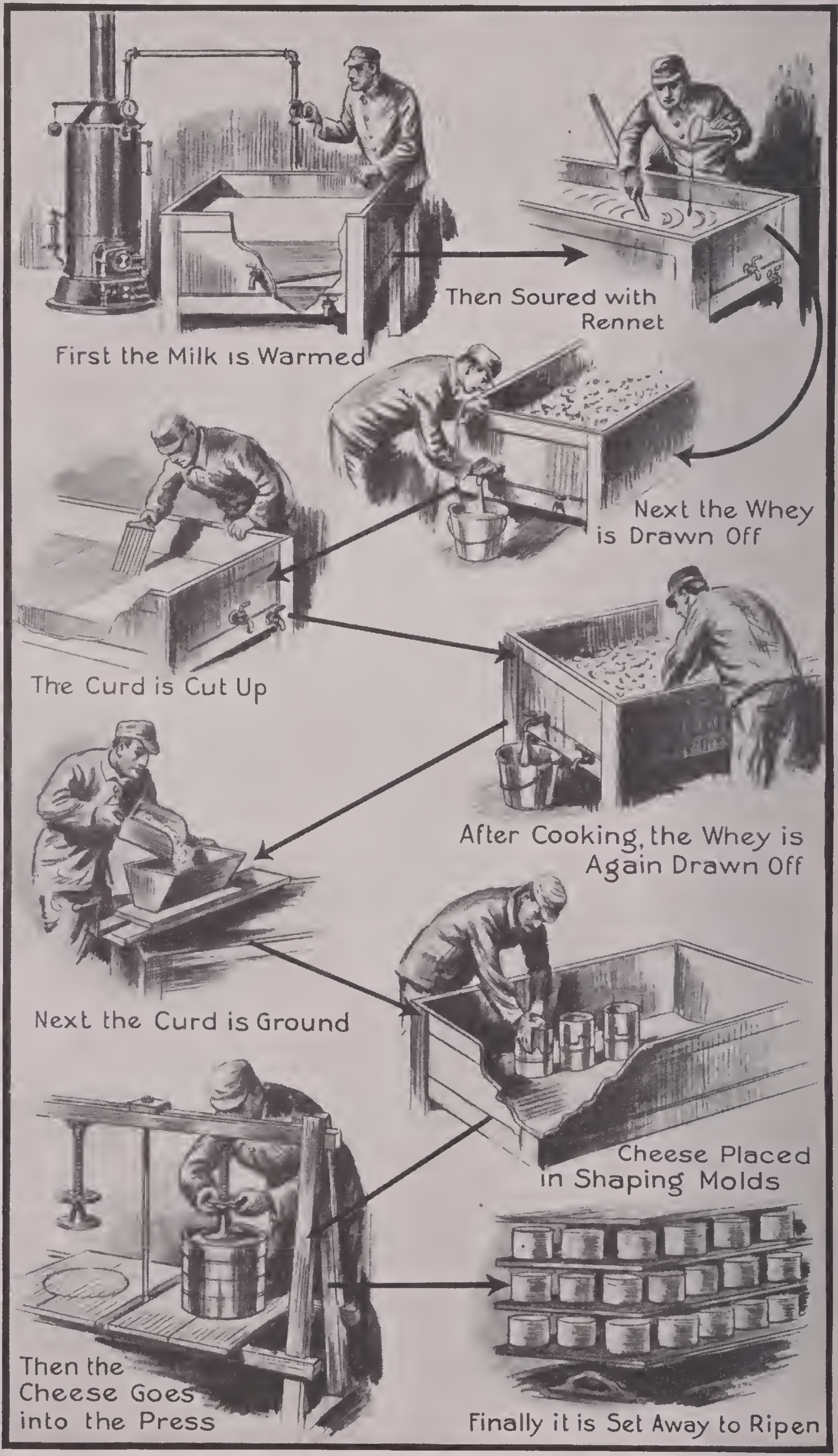
This shows a white "man" taking two of his opponents by jumping over them in the way indicated by the arrows.

move either forward or backward, but still only on the squares of the color in which the game is played. When all the men of one side have been captured, or when the remaining men of that side are so blocked by the opposing forces that none of them can be moved without capture, the game is won by the player who has thus outgeneraled the other.

CHEESE. You can imagine the delight with which, thousands of years ago, when primitive man had learned to tame and milk goats, sheep, and cattle, some wise old housewife discovered that if the milk is allowed to sour into a thick mass, then squeezed to press out the whey, and allowed to age for a few weeks or months, the result is a pleasant and nutritious sort of food. In some such way cheese was invented in the far-off forgotten past. The oldest mention of it is about 1400 years before Christ. It was known to the ancient Egyptians and is mentioned in the Bible. The early Greeks were familiar with cheese long before they knew how to make butter, and also the Romans.

But in all the thousands of years that man has been making cheese, he did not discover until a few years ago why it was that he could

NINE CHAPTERS IN THE LIFE OF A CHEESE

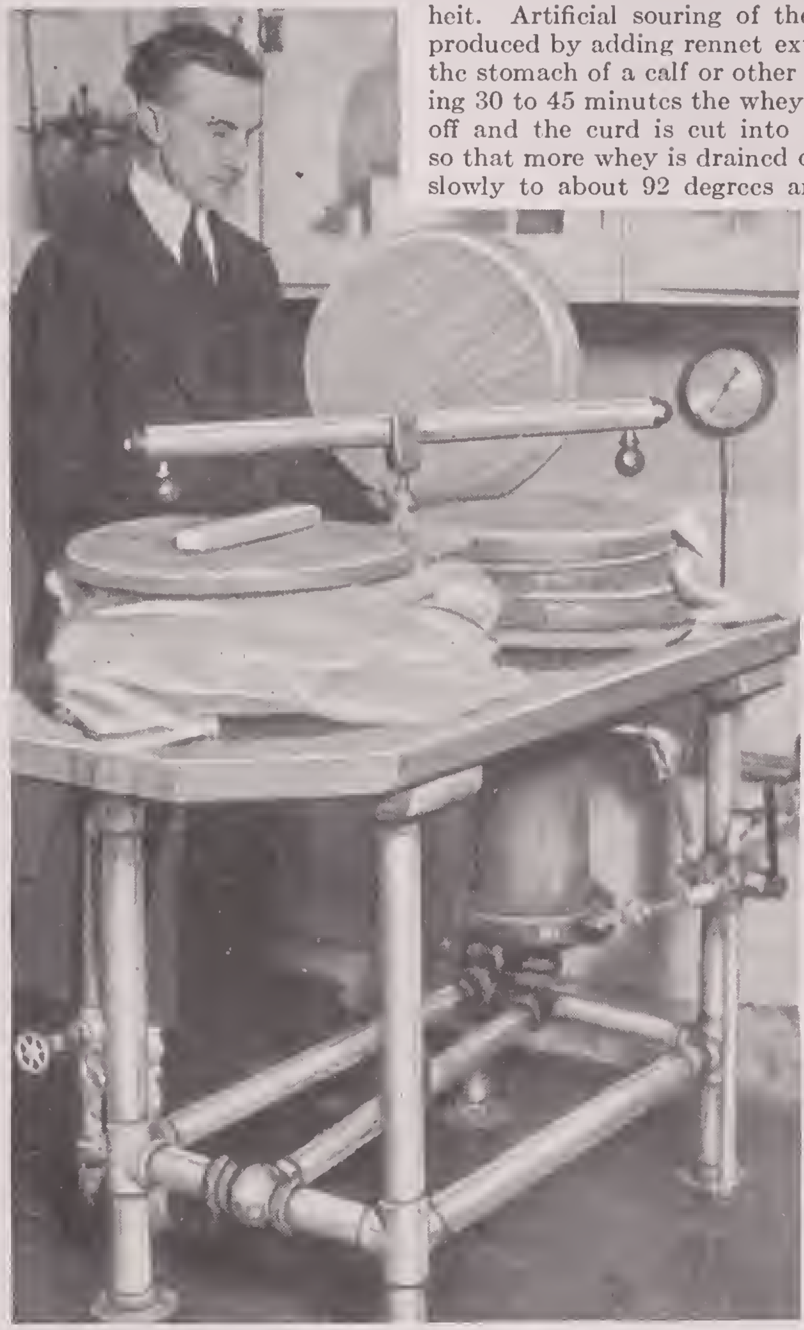

First the Milk is Warmed
Then Soured with Rennet
Next the Whey is Drawn Off
The Curd is Cut Up
After Cooking, the Whey is Again Drawn Off
Next the Curd is Ground
Cheese Placed in Shaping Molds
Then the Cheese Goes into the Press
Finally it is Set Away to Ripen

never tell how his cheese was going to turn out—what sort of flavor it would have and whether it would be good or poor. Today we know that the chief factor is the "ripening" or "aging," and that the flavor depends largely on the sort of bacteria that are active during this process. Scientists have now succeeded in obtaining separately the different varieties of cheese bacteria, so that the dairyman can put in any particular sort needed and thus get the flavor he wants. Added variety is obtained by flavoring the cheese with pimentoes, sage, parsley or other herbs, and often artificial coloring matter is put in. Most cheese is made from cow's milk, but the milk of sheep and goats is also used. By varying the materials, and using cream, whole milk, or skimmed milk, and by changing the seasoning and the process of curing, more than 150 varieties of cheese are today made in Europe and America.

Until 1851 all cheese was made on the farm and in the home, but today it is practically all made in factories. About the only cheese now made at home is the familiar "cottage cheese," which is merely the fresh curd of milk, usually mixed with cream. While the United States imports considerable amounts of the famous cheeses of Europe, it makes about ten times as much as it imports. Many of the foreign cheeses are successfully imitated, but 90 per cent of the output—the so-called American cheese—is practically the same as the English Cheddar, and is often known by that name. New York and Wisconsin between them make about three-fourths of the entire output of the country.

Cheese ranks very high in nutritive value. One pound of American cheese has nearly the whole of the protein and most of the fat of a gallon of milk, while an equal weight of beef contains less than half as much nourishment. Hence cheese may well take the place of meat in a meal. Experiments show that it is a wholesome food, having no harmful effects on digestion even when eaten in quantities as a meat substitute.

A TIGHT SQUEEZE MAKES GOOD CHEESE



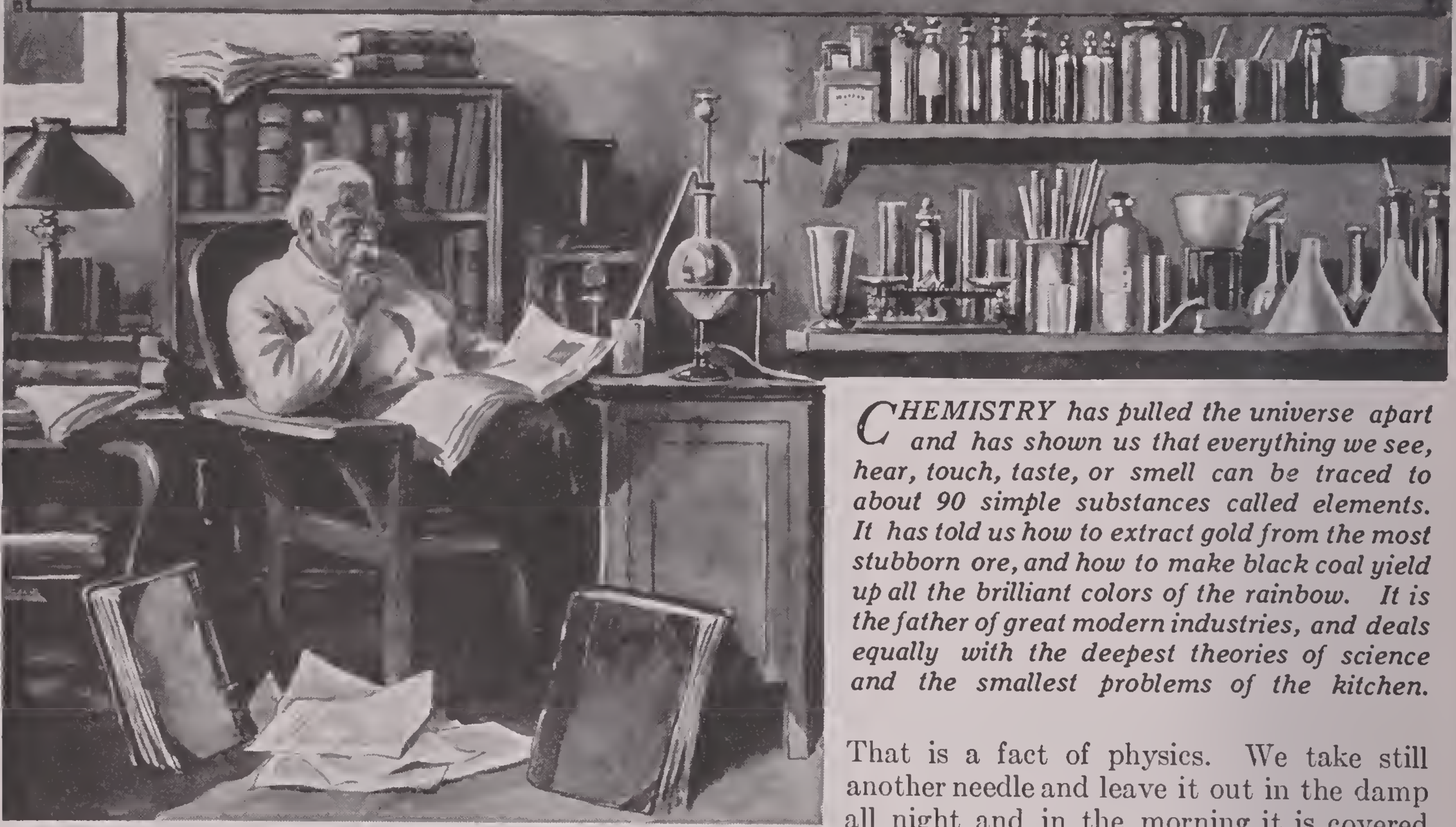
The old-time cheese presses required great weights and levers, but this modern machine accomplishes the work with hydraulic or water power. While the cheese is being squeezed, it is kept at the right temperature by warm water which circulates through the supports and bed of the press.

Cheese is made from the curd of milk, which contains casein (a protein compound), fat, and other constituents. In making American cheese, the milk, preferably sweet milk rich in fat, is slowly heated to about 84° Fahrenheit. Artificial souring of the milk or coagulation is then produced by adding rennet extract, which is obtained from the stomach of a calf or other young animal. After standing 30 to 45 minutes the whey or watery portion is drained off and the curd is cut into small bits and stirred slowly so that more whey is drained out. The curd is then heated slowly to about 92 degrees and cooked for several hours, until the curd is firm when squeezed in the hand. The whey is again drained off and the curd turned and piled. When well drained the curd is ground or thoroughly broken up by stirring, and salt is added. After this it is pressed into shaping molds or "cheese hoops" lined with cloth which will cover the finished cheese to keep it clean. The cheese is then put away in a cool dry place to ripen.

In the process of ripening, many types of cheese become streaked with mold, which gives them a characteristic highly prized flavor. The mold is sometimes artificially cultivated and introduced into the cheese before it is put away to ripen. According to the amount of water it contains and the method of ripening, cheese is classified as hard or soft. The best known cheeses, their characteristic qualities, and their place of origin are: *Brie*, soft white cream cheese, France; *Camembert*, soft rich cheese, France; *Cheshire*, hard dry reddish cheese with blue-green mold, England; *Edam*, hard mild reddish cheese, pressed in round molds and dyed crimson on the outside, Holland; *Gorgonzola*, hard rich cheese with green and red mold, Italy; *Gruyère*, hard yellowish cheese full of holes, Switzerland and France; *Limburger*, soft cheese with a very strong flavor and odor as the result of fermentation induced by keeping it exceedingly moist while ripening, Holland; *Parmesan*, hard greenish skim-milk cheese, Italy; *Roquefort*, slightly soft cheese made from sheep's milk, streaks of mold, ripened in caves, France; *Stilton*, hard rich strong cheese streaked with mold, ripened for two years, England; *Swiss*, similar to *Gruyère*, Switzerland.

Most foreign cheeses and the highly flavored domestic varieties are made and sold in characteristic molds containing enough for a few meals for a family. Swiss and so-called American cheeses, however, are often made in huge molds shaped like millstones, some of them weighing several hundred pounds.

The MAGIC *of* TEST TUBE *and* RETORT



CHEMISTRY has pulled the universe apart and has shown us that everything we see, hear, touch, taste, or smell can be traced to about 90 simple substances called elements. It has told us how to extract gold from the most stubborn ore, and how to make black coal yield up all the brilliant colors of the rainbow. It is the father of great modern industries, and deals equally with the deepest theories of science and the smallest problems of the kitchen.

CHEMISTRY. The inspired visionary often puts into a few words the truth that men of science reach only by long and laborious toil; and when the poet wrote that famous line, "Change and decay in all around I see," he was saying in a poet's way what chemistry is forever saying as a scientific fact.

We put a match to the neatly laid fire in the grate and in a moment smoke curls up and flames burst forth; and as we watch the fire burn we see strange changes taking place. Paper and wood disappear, while the glossy black coal flames up and glows and shrinks till it becomes only dust and cinders. Change and decay have taken place before our eyes, and it is the science of chemistry that tells us how and why those changes occur.

Physics and Chemistry Linked

Chemistry is really the science of different kinds of matter and their relation to one another, and it is very closely connected with the science of physics, which explains the forces and forms of energy. In fact no one can say where chemistry ends and physics begins, and the great discoveries about atoms and molecules which have been made of late years on the borderline between the two sciences have given rise to a new linking branch of science which we call physical chemistry.

We take a steel knitting needle and put it into a bottle of vitriol or sulphuric acid and it is eaten away. That is a fact of chemistry. We take a similar needle and draw a magnet across it several times in one direction and the needle itself becomes a magnet. That is a fact of physics. We take still another needle and leave it out in the damp all night and in the morning it is covered with rust. That is a fact of both chemistry and physics, for the production of a new substance, rust, is chemistry, and the fact that the rusty needle will not conduct electricity so well as when it was bright is physics.

How the Alchemists Gave Us Chemistry

Really chemistry is quite a modern science, but it had its beginnings long ago in the days of the old alchemists. Those chemists of the Middle Ages were interested in only one thing. They sought frantically for some means of changing the baser or cheaper metals into gold. For centuries they worked vainly at this strange task to the neglect of more important matters.

But later on, in more modern times, famous men like Cavendish, Priestley, and Lavoisier began to study the nature of matter. They divided up various bodies like air and water into more elementary substances and gradually a list of elements was compiled—substances which it was supposed could not be split up into anything simpler. Thirty years or so ago the list contained 64 elements such as gold, silver, tin, copper, zinc, iron, carbon, sulphur, hydrogen, oxygen, nitrogen, chlorine, and many rarer substances, and it was generally believed that these comprised the whole of the elements. Such substances as radium and helium were not then dreamed of. Nor were many of the relations between the elements clear.

But in recent years many more elements have been discovered and now there are about 90 known. In

1815 an English physician, William Prout, suggested that all the elements were compounds of one mother substance, hydrogen, but the idea was ridiculed. The very latest discoveries in chemistry and physics, however, rather point to the fact that Prout's idea of a single basic origin of all matter is more or less correct, in which case the quest of the old alchemists would appear to be not quite so mad as was supposed, and in the hands of the new chemists may prove successful. It may yet be possible to change the baser metals into gold, but probably nobody will want to do so.

An ignorant person would tell us that the world is composed of soil, rock, and water, surrounded by air. But the chemist analyzes these substances, and finds such substances as metals everywhere—in the air and in the ground. Further, he discovers that the commonest metal in the world is not iron or copper or zinc or tin, but aluminum. Yet less than a hundred years ago this metal was not even known. Out of every 100 parts of the earth's crust 8 are aluminum, whereas only 6 are iron.

Of all the different elements that form the crust the most abundant is a substance which we cannot see—the invisible gas, oxygen, which comprises half of the earth as we know it. The next most abundant element is silicon, which forms nearly a third of the crust, and then come six of the metals in the following order: aluminum, iron, calcium, magnesium, sodium, and potassium.

But taking the earth as we know it, with its soil and rocks and mountains and sea and rivers, why is it that we do not see the iron and aluminum and other elements? It is because they are combined in such a peculiar way that entirely different materials are formed—different in color, in form, in properties. They are not merely mixed, be it understood, but chemically combined.

One of the great facts of chemistry, indeed the outstanding fact, is the fundamental difference between a mixture and a compound. You take some finely ground salt and sugar and shake them together, and they become so inextricably mixed that only by an elaborate and tedious process could they be separated again. Yet they remain salt and sugar, and even if you dissolved them in water, they would still remain salt and sugar, each retaining its own peculiar qualities of color, taste, and so forth. They form merely a mechanical mixture, and not a chemical compound.

AN ALCHEMIST OF THE MIDDLE AGES TRYING TO MAKE GOLD

"The alchemists of the Middle Ages were interested in only one thing. They sought frantically for some means of changing the baser or cheaper metals into gold. For centuries they worked vainly at this strange task to the neglect of more important matters."

But take some powdered sal ammoniac and mix it with powdered soda. At once you smell ammonia. A strange change takes place. The soda and sal ammoniac no longer remain, but when mixed they combine chemically to form entirely new substances which have quite different properties from soda and sal ammoniac.

Take another example. Mix powdered sulphur and iron filings together and they remain sulphur and iron, a mere mechanical mixture. You could separate them easily by drawing out the iron filings with a magnet. But now apply heat to the mixture and at once the two substances combine to form a black material called iron sulphide, which is neither iron nor sulphur and has no resemblance to either. The new substance is a chemical compound and the force which makes various elements combine into compounds is known as chemical attraction, the mightiest force in all nature.

It is this force which leads to the production of all the myriad substances found in the world, yet, as chemistry shows us, all made up of about 90 elements. All the beauty of sense and taste is produced by it.

Chemical attraction—the strange affinity which certain elements have for certain other elements so that they combine to form new substances—is a marvelous force, for sometimes it acts with the malignant violence of the earthquake and volcanic eruption, bringing terror and disaster in its train; while at other times its movement is as gentle as the rain and as quiet as the still small voice.

THE MAN OF MAGIC AT WORK IN HIS CELL

Roger Bacon was a monk who tried in the 13th century to penetrate the secrets of science. Considering the crude instruments he had at his disposal, he made remarkable progress—so remarkable indeed that he was suspected by some of his fellow monks peering in through the window there, of dealing with Black Magic.

No one can explain its operations, but the chemist has shown us how to harness and use this mighty force. It can be used for good or for evil. All that is worth having of material welfare in our life would be impossible without it, and yet all the greatest horrors of war—high explosives, poison gas, flame throwing, and so on—are due to this force.

Take a well-known example of its power. You mix charcoal, saltpeter, and sulphur together and the three ingredients are distinct. The mixture is harmless and can be kept indefinitely without anything happening. If, however, you raise the temperature by setting fire to the mixture, there is a tremendous explosion. The substances that seemed at first to have no attraction for one another have suddenly rushed together. No longer is there any charcoal, saltpeter, or sulphur, but instead various gases, bearing no resemblance whatever to any of these three substances, have been produced in a moment, and, needing room to spread themselves out, have blown everything before them. The mixture of these three substances we call gunpowder.

But the force of chemical attraction is not always so uproarious in its action. As an instance of its silent working we may take the rusting of iron. The oxygen of the air combines chemically with the iron to form ferrous oxide, popularly known as red rust, and it is all done quietly without any dramatic outburst.

To get some idea of how mysteriously this force

THE MODERN ALCHEMIST AND THE GRAIN OF WHEAT

The chemist of today has accomplished things more wonderful than were ever dreamed of by the ancient alchemists. He has taken old and common substances and turned them into the gold of daily usefulness. That man you see standing in his laboratory with an ear of wheat in his hand knows how to make out of that wheat ingredients for all the things represented around him—soap, bread, starch, jellies, oil, fireworks, candy, chemicals used in the preparation of rubber, paint, varnish, cattle feed, alcohol for that alcohol lamp, sugar and syrup for those pancakes. And this is only one of the thousands of marvels of chemistry—the science which takes the substances provided by Nature and combines them into new products for the service of mankind.

works and the marvelous changes it brings about, two familiar instances present themselves. There is a very dangerous metal known as sodium which ignites spontaneously in the atmosphere, and for safety has to be kept in naphtha. If we want a piece of it we dare not bring it into the air, but must cut it while it is still in the naphtha. It must on no account be touched with the bare fingers or a painful burn will result.

Then there is a highly dangerous gas called chlorine. It is very suffocating and was used in the World War to kill whole regiments of soldiers. If only a small proportion is in the air of a room, caged birds and mice will die.

We heat a small piece of sodium, this dangerous metal, and introduce it into a jar of chlorine, this still more dangerous gas, and the sodium bursts into flame and burns with a fine golden-yellow flame. The chemical attraction of the sodium for the chlorine is in operation. The dangerous metal and the dangerous gas both completely disappear, and in their place comes an entirely different substance with none of the properties of sodium or chlorine, a substance that is not only harmless, but is positively essential to the healthy life of man—common salt. The force of chemical attraction makes life-preserving salt from the dangerous metal sodium and the suffocating gas chlorine.

Here is the other familiar example. There is a gas which we call hydrogen, the lightest of all known substances. It burns with a pale blue flame that is very hot. Then there is another gas, oxygen, present in the atmosphere, which will not itself burn, but which makes it possible for other substances to burn. We burn a jar of hydrogen in a jar of air which contains much oxygen. Soon the hydrogen gas ceases to exist, the oxygen in the air of the jar also disappears, and in their places we find little drops of moisture, which prove to be ordinary pure water.

Attractions of the Chemist's Profession

A tremendous future lies before any young man or woman who chooses the study of chemistry as a life work. Not only does the chemist's profession lead into paths of the utmost scientific interest, delving into the most fascinating of life's problems, but it has an intensely practical and profitable side.

Many of the comforts of life which we enjoy, much of the enormous progress in medicine and agriculture, are due to the chemist in his laboratory. There is hardly a branch of industry which does not require the services of this keen-eyed, nimble-witted investigator. Steel-makers have their ores examined and every step in the process guarded by chemical analysis. Bakers employ chemists to aid them in buying the proper flour and in improving their processes of bread-making. Business houses buy their coal according to its fuel value as determined by chemistry. Rubber companies employ chemists to work out the best methods for improving their products. The meat-packing companies have an army of chemists employed in finding ways of using their waste products, until waste has almost disappeared. Soap-makers have chemists to keep their soaps uniform. Wholesale grocers use them to find the best temperature for roasting coffee. Farmers learn from them how best to fertilize their soil.

The Chemist as an Inventor

The expert in chemistry often invents new substances which prove of measureless value. Fiber silk, celluloid, bakelite, "papier mâché," waterproof garments, artificial rubies, gas mantles, all sorts of building compositions, and metal alloys, numberless dyes and stains, photographic films and plates, substitutes for rubber, leather, and cloth, special kinds of glass for fine lenses—these are just a few of the products of his work.

Public health departments have their laboratories for identifying and combating disease, for testing food, milk, drugs, etc. In the pursuit of criminals, the law calls upon the chemist to detect poisons and blood stains, or find evidence of forgeries in the ink of signatures. And the high explosives, poison gases, liquid fire, and other weapons of destruction used in the World War of 1914–18 show what powerful persons are the chemists when nation attacks nation and the bitter rivalry of battle is born.

Chemistry is usually divided into two branches, *inorganic* and *organic*. The organic branch deals chiefly with those countless compounds of carbon which are usually produced only by the life processes of "organic" or living things—plants and animals. Albumen, for instance, of which the white of an egg is principally made up, is one of the commonest of organic chemical compounds; the fats and oils, the sugars, the cellulose of which wood and cloth are composed, are other such compounds. It is in this branch that the industrial chemist does most of his work, investigating these intricate substances, devising substitutes for them, or finding artificial ways of doing nature's work. Many organic compounds, formerly believed to be obtainable only from natural sources, are now "created" by synthetic chemistry.

Inorganic chemistry deals with the elements themselves and those simpler compounds which exist or are produced in nature without the intervention of living organisms, or which can readily be made from the elements in the laboratory. Such compounds are salt, water, glass, etc.

The Smallest Things in the World

Suppose we consider the smallest particle of common salt which can exist and still have the properties of salt. It is called a *molecule* of salt. The still smaller bits of sodium and chlorine which compose this molecule are called *atoms*. Thus, one atom of sodium united to one atom of chlorine by that mysterious chemical attraction we discussed earlier produces one molecule of salt.

Until the invention of the ultra-microscope (*see* Microscope), no one had ever seen anything so small as a molecule, much less an atom. But scientists claim that by means of this instrument some of the larger molecules, such as the molecule of albumen, have been observed. One of the most striking differences between the simple inorganic compounds such as salt and the highly complicated organic substances such as albumen is shown by the fact that, whereas the salt molecule consists of only two atoms, the albumen molecule contains more than 2,000, contributed by five different elements—hydrogen, carbon, oxygen, nitrogen, and sulphur.

WHAT THE WORLD IS MADE OF

ELEMENT	CHEMICAL SYMBOL	ELEMENT	CHEMICAL SYMBOL
Aluminum	Al	Mercury	Hg
Antimony	Sb	Molybdenum	Mo
Argon	A	Neodymium	Nd
Arsenic	As	Neon	Ne
Barium	Ba	Nickel	Ni
Beryllium	Be	Nitrogen	N
Bismuth	Bi	Osmium	Os
Boron	B	Oxygen	O
Bromide	Br	Palladium	Pd
Cadmium	Cd	Phosphorus	P
Caesium	Cs	Platinum	Pt
Calcium	Ca	Potassium	K
Carbon	C	Praseodymium	Pr
Cerium	Ce	Radium	Ra
Chlorine	Cl	Rhodium	Rh
Chromium	Cr	Rubidium	Rb
Cobalt	Co	Ruthenium	Ru
Columbium	Cb	Samarium	Sa
Copper	Cu	Scandium	Sc
Dysprosium	Dy	Selenium	Se
Erbium	Er	Silicon	Si
Europium	Eu	Silver	Ag
Fluorine	F	Sodium	Na
Gadolinium	Gd	Strontium	Sr
Gallium	Ga	Sulphur	S
Germanium	Ge	Tantalum	Ta
Glucinum	Gl	Tellurium	Te
Gold	Au	Terbium	Tb
Helium	He	Thallium	Tl
Hydrogen	H	Thorium	Th
Indium	In	Thulium	Tm
Iodine	I	Tin	Sn
Iridium	Ir	Titanium	Ti
Iron	Fe	Tungsten	W
Krypton	Kr	Uranium	U
Lanthanum	La	Vanadium	V
Lead	Pb	Xenon	Xe
Lithium	Li	Ytterbium	Yb
Lutecium	Lu	Yttrium	Yt
Magnesium	Mg	Zinc	Zn
Manganese	Mn	Zirconium	Zr

This table contains the names of 82 "established" elements of chemistry. There are a few other substances whose title is still under dispute. From time to time, also, new elements are discovered, but with these symbols to help you, you will be able to read virtually any simple chemical formula.

When we consider the ultimate constitution of atoms, we enter the field of physical chemistry and we have a new and marvelous world opened out to us. It is as though a wizard had drawn back the veil and shown us an Aladdin's cave of wonders. The building up of atoms and molecules from electrons—the constant movement going on among these tiny particles, the marvel of radium and radio-active substances—all these come into the province of physical chemistry, which is perhaps the most fascinating and the most romantic branch of all science (*see* Atoms and Electrons; Radium).

So rapid in succession are the discoveries made in this field that if a book is written today, embodying everything that is known, it is out of date in a year or two, for almost every week brings a new and important discovery.

The first law of chemistry is that matter cannot be destroyed. The most careful experiments have shown that no gain or loss of total weight takes place during any chemical change. There is an old trick question: "How can you weigh the smoke of a cigar?" to which the answer is: "Weigh the cigar before lighting it, and weigh the ashes afterward." In fact, this is no trick at all, but the solid truth; for if the smoke and gases that escape could be weighed with the ashes they would exactly equal the weight of the original cigar, plus the oxygen that has been absorbed from the air during the burning.

This law, known as the "law of the conservation of matter," makes chemical analysis possible. A strange substance is submitted to a chemist, who is asked to tell what it is. He may burn it and collect the gases, or he may dissolve it in acids, or break it up into simpler forms in any one of a dozen different ways; but in the end, he will be able to tell you not only the different elements that made up the substance, but the proportion of each element, for nothing is lost during the process. If you put a silver spoon in strong nitric acid, it will dissolve and disappear, but the metal has not been destroyed. Every bit of it is still there in the liquid, and can easily be recovered and made into a spoon again of exactly the former size and weight.

If you take a piece of metal to a chemist and, after making his tests, he tells you simply that it is brass, made up of copper and zinc, you have an example of "qualitative analysis," which seeks only to determine the *kind* of chemicals in a substance. But if he makes further tests and tells you that the brass contains two-thirds copper and one-third zinc, that is "quantitative analysis," which seeks to find out the *quantity* of each chemical present.

The chemist always writes down the results of any analysis in strange looking numbers and initials. These *formulas*, as they are called, are not half so mysterious as they appear, for each letter symbol stands for the name of some one of the 90 or so elements, and the small figures to the lower right of a letter indicate how many atoms there are of that particular element in the compound. The large figures before any letter or combination of letters show how many parts of that particular free element or compound are present.

Thus, if you should dissolve one teaspoonful of salt in 50 teaspoonfuls of water and have it analyzed, your answer would look like this: $NaCl + 50\,H_2O$. Na is the symbol for sodium, Cl the symbol for chlorine. When one atom of sodium unites and forms a compound with one atom of chlorine, that combination is indicated by the symbol NaCl, which is translated as one molecule of sodium chloride, the scientific name for common salt. Similarly the letter H stands for hydrogen and O stands for oxygen. But, in this case, two atoms of hydrogen (H_2) combine with one atom of oxygen to produce H_2O or water, and the "50" indicates that for every molecule of salt there are 50 molecules of water. The plus sign (+) dividing the salt and water in the formula shows that they formed a simple mixture and not a compound.

CHERRY. In Korea the cherry tree is an object of respect bordering on worship; and in Japan it is the occasion for a cherry festival in the spring of each year, when thousands of people collect in those places that are famous for their rose-flowered cherry trees, to admire their feathery loads of blossoms. Many of these ornamental varieties do not fruit at all, and they are cultivated for their blossoms alone. We of the West cultivate the cherry tree not so much for its beautiful flowers, its satiny-brown bark, and its leaves of glossy green, as for its luscious fruit. The wood also of the wild cherry is valuable for cabinet purposes.

Several wild species of cherry grow in America, but the cultivated varieties, both sweet and sour, originated in Asia and came to us from Europe. They are grown in orchards in many parts of the country. California ships the sweet cherry in great quantities to eastern states, and in New York the sour cherry is the basis of a large canning industry.

The cherry belongs to the genus *Prunus*, which also includes the almond, apricot, peach, and plum. *Prunus avium* includes the sweet cherries; the "Bigarreaux," firm, heart-shaped, and either light or dark, which is the favorite in California, and is shipped to markets all over the United States; "Hearts," soft and sweet, which are grown chiefly for home use; "Marascas," an Italian variety, which furnishes the juice for the cordial "maraschino"; and "Dukes," which are light colored and somewhat acid. To *Prunus cerasus* belong the sour cherries, chief of which is the dark-colored "Morello," grown largely in New York.

CHESAPEAKE BAY. Late in April 1607, three frail little vessels sailed between two capes into the great arm of the Atlantic which was later named Chesapeake Bay. These vessels found their way up a stream emptying into the bay, and on its banks founded Jamestown, the first permanent English settlement in America. In the next two years the energetic leader of the colony, Captain John Smith, explored the shores of the bay and many of its tributaries.

Many other historic events are connected with this great inlet—the largest on the Atlantic coast. Its waters were plowed by the vessels which carried to England the tobacco and the furs of the colonists. On one of its tributaries was played out the closing scene of the Revolutionary War—the defeat and surrender of Cornwallis at Yorktown. Through its quiet waters passed the British expedition that burned Washington in 1814.

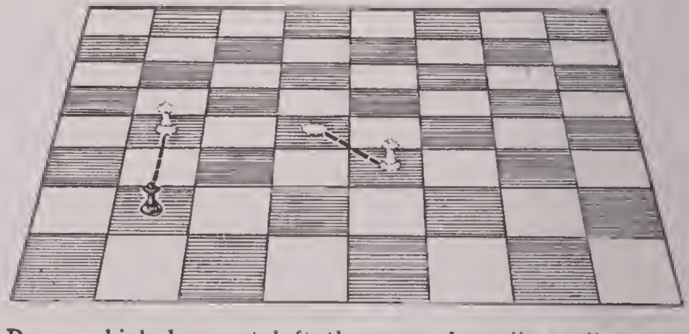
Today the bay, which divides the state of Maryland in two and separates also one part of Virginia from the rest, is busy with a great traffic. Ocean liners and big cargo steamers mingle with the host of smaller craft. The latter are either oystermen, or carry on a brisk trade in vegetables and watermelons grown in the truck gardens on the eastern shore and sold in the large cities across the bay.

Innumerable fish, including the highly prized shad, inhabit the waters of the Chesapeake, and the reed-grown banks of its tributaries are still haunted by the canvasback duck and the terrapin. Its chief source of wealth, however, is the great oyster beds which supply many of the eastern markets.

Chesapeake Bay is 200 miles long, from 4 to 40 miles wide, and from 30 to 60 feet deep. Baltimore, a great shipping port; Annapolis, the site of the United States Naval Academy; and Norfolk, a shipping port and naval base, are situated on or near its shores; while the city of Washington is on one of its tributary rivers, the Potomac. Where the James River enters the bay is Hampton Roads, an important military point defended by two forts. During the Civil War this was the scene of the famous battle of the *Monitor* and *Merrimac*. Besides the Potomac and James, the Chesapeake receives the waters of the Susquehanna, Rappahannock, York, and other rivers.

CHESS. The game of chess is a warfare in miniature. If we accept one tradition, it was invented in India to divert men from the attractions of actual war. In chess two opposing forces—consisting on each side of the king and queen, two bishops, two knights, two rooks (or castles), and eight pawns (foot soldiers), are drawn up in battle array, and the strategy of the conflict lies in making a successful attack on the enemy's king. When one player or the other is unable to protect his king from capture on the next move he is "checkmated," and the game is over.

In the hands of masters chess becomes one of the most intricate and interesting games ever invented. Its value as mental training has often been urged, and some experts have developed such ability that they can play 10 to 14 games at the same time, and with their eyes blindfolded.

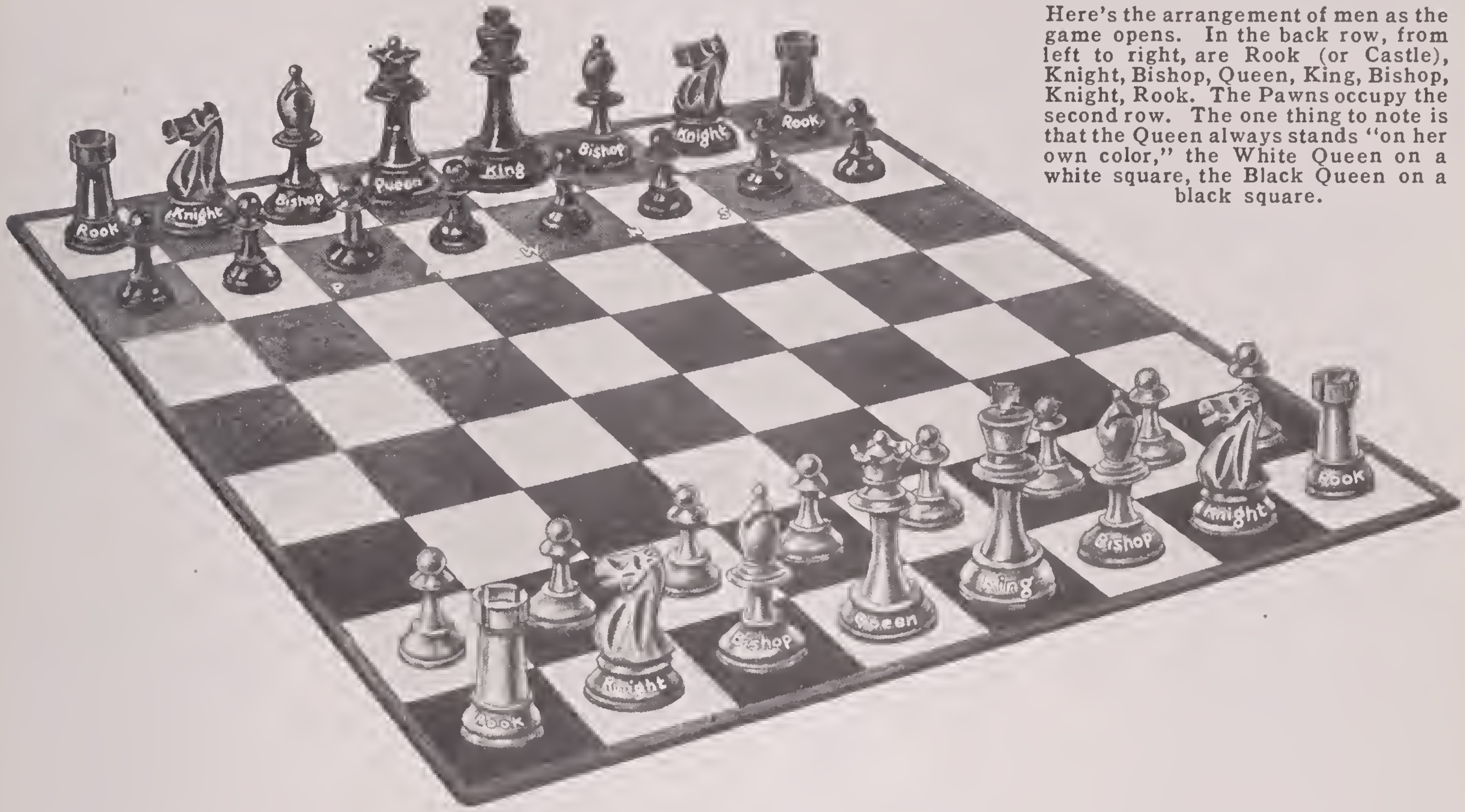


A Pawn which has not left the second or "pawn" row may move one or two squares ahead in its first move. After that it may only move one square. In capturing an opposing piece, however, the pawn moves forward one diagonal square.

Chess is probably the most ancient of all games of pure skill. Its origin is lost in the legends and traditions of the past. It was undoubtedly invented somewhere in the Far East, passing from India to Persia, and thence to Europe. The word "chess" is supposed to be derived from "Shah," the Persian word for king, and "checkmate" from "shah mat," meaning "the king is dead."

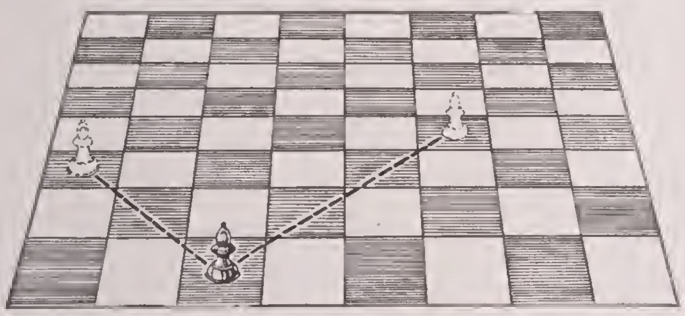
The chessboard is the same as the ordinary checker-

THE CHESS ARMIES DRAWN UP FOR BATTLE



Here's the arrangement of men as the game opens. In the back row, from left to right, are Rook (or Castle), Knight, Bishop, Queen, King, Bishop, Knight, Rook. The Pawns occupy the second row. The one thing to note is that the Queen always stands "on her own color," the White Queen on a white square, the Black Queen on a black square.

board. It is divided into 64 alternating black and white (or red) squares, and the board is so placed that each player sits with a white (or red) square at his right hand. In setting up the pieces always "give the queen her color," that is, always place the white (or red) queen on the proper white (or red) square and the black queen on the proper black square.



The moves of the Bishop are diagonal, but if there's nothing in the way he can go as far as he pleases. His method of travel, as you can see, keeps him always on squares of the same color.

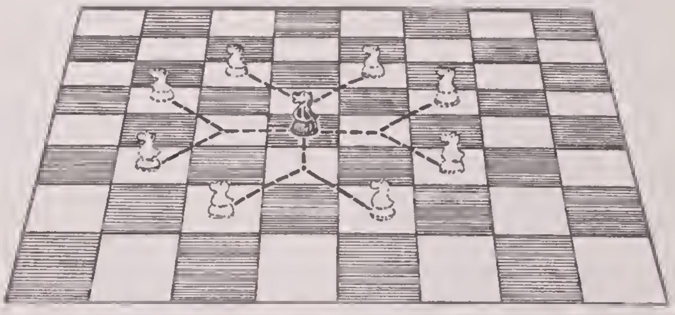
How the Pieces are Placed

The accompanying diagram shows the position of the pieces and pawns on the chessboard at the beginning of a game. The pieces next to the king are called king's bishop (K.B.), king's knight (K. Kt.), and king's rook (K. R.) or castle; while those next to the queen are designated as the queen's pieces; for example, queen's bishop (Q. B.), etc. In front of these pieces are arranged the pawns. The notation "P—K.Kt. 4" indicates that the pawn (in this case the pawn in front of the king's knight) moves to the fourth square in the king's knight column.

A very simple game, called the "scholar's mate" or "fool's mate," is given here:

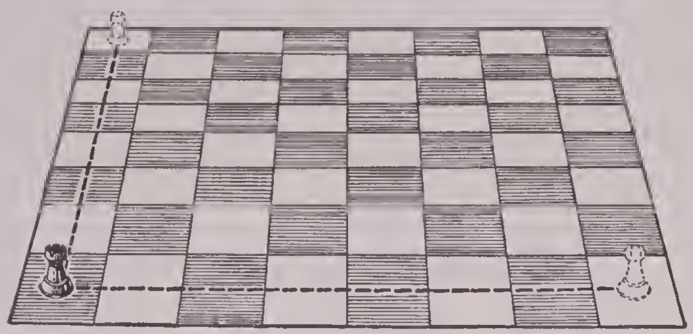
White	Black
1. P—K4	1. P—K4
2. K.B.—B4	2. K.B.—B4
3. Q—R5	3. K.Kt.—B3
4. Q takes B.P. (check and checkmate)	

This game, though won by White by methods that could easily be defeated, illustrates several of the moves of chess. A pawn moves one square ahead, except on the first move when it may be advanced two squares. Pawns cannot move backwards. In making a capture, however, the pawn moves diagonally and occupies the square of the captured man. A bishop moves diagonally in any direction and for any distance so long as it keeps to the square of its own color. The knight moves one square vertically or horizontally and one square diagonally. The knight has a special privilege not accorded to the other pieces; it can accomplish its move by jumping over any men that happen to be in the way, provided the move can be completed on a vacant square, or on one occupied by an opposing man, in which case the knight captures it. Unlike checkers, however,

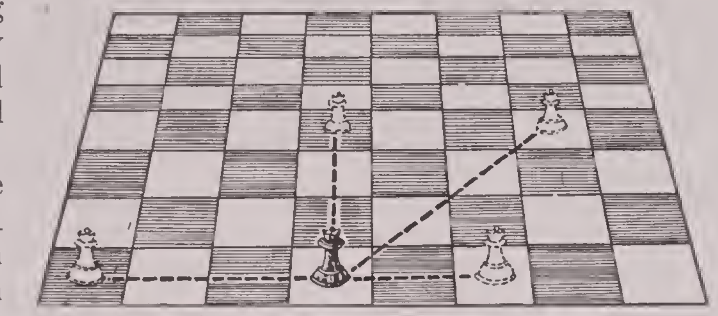


The most curious traveler of all is the Knight. From where he stands in the middle of this board, he can jump to any of the positions indicated by the dotted lines. This is described as "one square ahead and one diagonal."

"jumping" does not involve the capture of the intervening pieces. The rook or castle moves either vertically or horizontally any distance so long as the path is open. The queen is the most valuable of all the pieces; she can move vertically, horizontally, or diagonally, and for any distance. The king, on the other hand, is rather restricted; he can move in any direction, but to the extent of only one square. A capture is made by moving into a square occupied by an opposing piece, and all captured pieces are removed from the board.

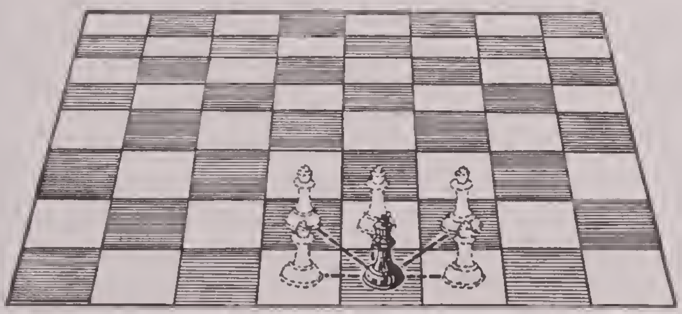


The Rook moves as far as he likes in straight lines; that is, lines parallel to the sides of the board.



The Queen is the most powerful piece of all, moving at will in any continuous direction, straight or diagonal, for any distance where the lines are clear.

Besides these there are certain special moves. A player may "castle" when his king row is open on either side between the king and the rook. The rook is moved up to the king and the king is "jumped" over to the other side of the rook. This cannot be done if either piece has previously been moved, if the king is in check, or if an opposing man could reach one of the intervening squares in a single move. A pawn which reaches the king row of the opposing side becomes a queen or any other piece the owner of the pawn may choose. It is thus possible to have two or more pieces with queen's privileges at the same time.



The King may move in any direction, but only one square at a time. He may not, however, move into a position threatened by an opposing piece.

To "check" the opposite player is to maneuver one piece or several pieces so that the enemy king is in danger of capture on the next move. Each time a king is thus threatened, the fact must be announced by the word "check." (The same is true when a queen is threatened, the word "queen" being used.) If a player is in check and cannot extricate his king, or capture the attacking man, or place some piece in front of the king as a protection, he is "checkmated." The king is never actually captured, and is never permitted himself to move into check. A "stalemate" occurs when one player or the other, though not in check, cannot move any of his pieces; more specifically, when one side cannot move without bringing his king into check. This is a draw. A game is also a draw when neither player has sufficient men left on the board to checkmate the other, as, for instance, when a king and one bishop are left against a king, or a king and one or two knights against a king. "Perpetual check" occurs when a player who cannot hope for checkmate is nevertheless able to check his opponent's king, move after move, with no possibility of escape, and this also constitutes a draw.

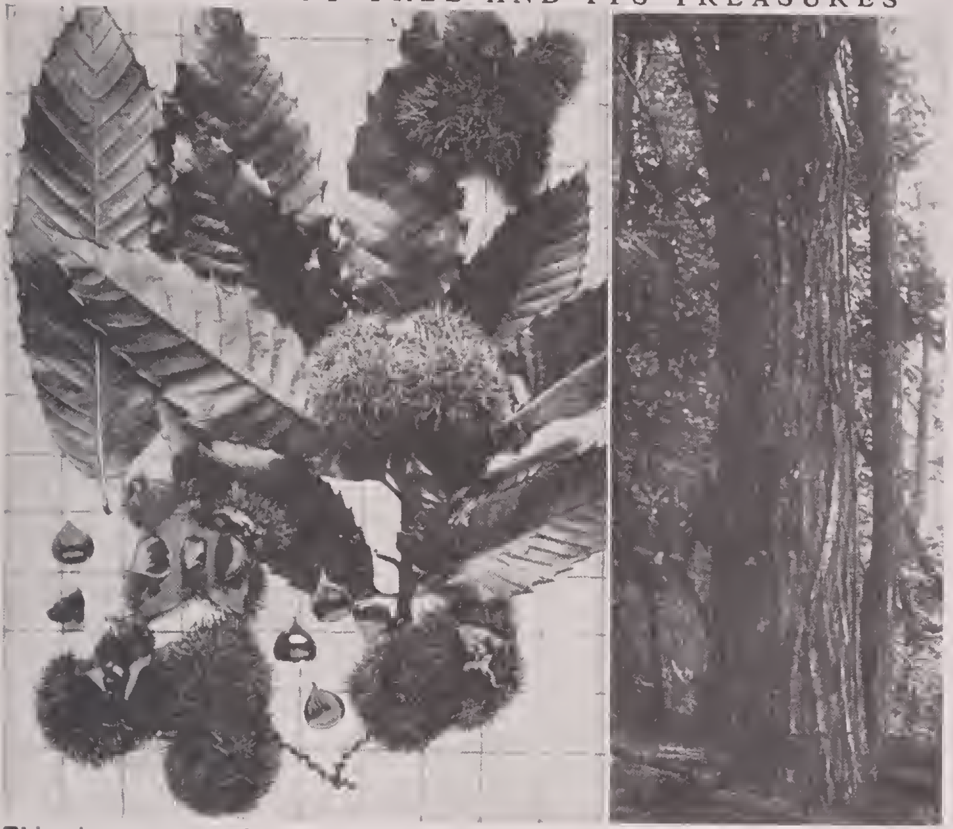
If a pawn which has not left the pawn row attempts to move two squares ahead, when such a move places it beside an opposing pawn, the opposing pawn may take the first pawn, just as if the latter had only moved one square ahead. This is called taking a pawn "in passing" or *en passant*.

A brilliant attack will sometimes win success before either side has lost many men, but in a hard fought match the game is usually won by an accumulation of a great number of small successes which weaken the enemy. A definite plan of attack is as a rule far better than a haphazard attempt to weaken the enemy by carrying off his pieces. A careful player always studies his opponent's moves as thoroughly as his own; not to do so is to invite disaster.

A Chestnut Burr after clever Jack Frost has opened it up in the fall.

CHESTNUT. When the first frost touches the prickly burrs of the chestnut tree the brown nuts rain down to the ground, bringing joy to the hearts of the boys and girls who are lucky enough to live in the vicinity. There are about five species of the true chestnut in temperate regions of America, Europe, northern Africa, and Asia. The American chestnut, which thrives in the Appalachian region from Maine to Georgia, and westward to Michigan and Louisiana, furnishes nuts which though small are superior in flavor to all other species. The tree, rising to a height of 60 to 100 feet, is symmetrically shaped, with a heavy top covered with an abundance of foliage. Another American species is the small chinquapin which thrives in the more southerly regions (*see* Chinquapin). Several species of the chest-

THE CHESTNUT TREE AND ITS TREASURES



This picture group shows the beautiful solid trunk of the chestnut tree, and at the left its leaves, burrs, and the nuts, which most of us know best when they are roasted hot on a frosty day! The wood of the chestnut tree is used for making furniture.

nut are cultivated in the United States for their nuts. The lumber is also valuable, being used extensively for interior finish, the manufacture of furniture, ties, posts, and fuel.

The large Italian or Spanish chestnut is a very important food product, and though its nuts are not so sweet as those of the American species, they are very palatable when cooked. These nuts grow on large trees, bearing correspondingly large burrs. The Japanese species is a dwarfish tree, but the fruit is larger than the American chestnut, though inferior in quality.

Scientific name of the American chestnut, *Castanea dentata*. Bark granite-gray, ridged in older trees. Leaves simple, alternate, oblong-lanceolate, feather veined. Fruit maturing in green prickly husks which open in four sections, disclosing three or four oval nuts.

CHEWING GUM. It is said that the amount of money spent in the United States for chewing gum each year is greater than for school textbooks. The chewing gum habit is peculiarly American, although the sale has extended in recent years to Canada and England and to other countries in smaller degrees.

Formerly spruce and other native forest resins or "gums" were used for chewing, and paraffin was also sometimes used. But of late years chewing gum has been made almost entirely of chicle gum, an elastic gum from the naseberry or sapodilla tree and other evergreens of Central and tropical South America.

Over ten million pounds of this gum, valued at more than $5,000,000, are imported every year into the United States.

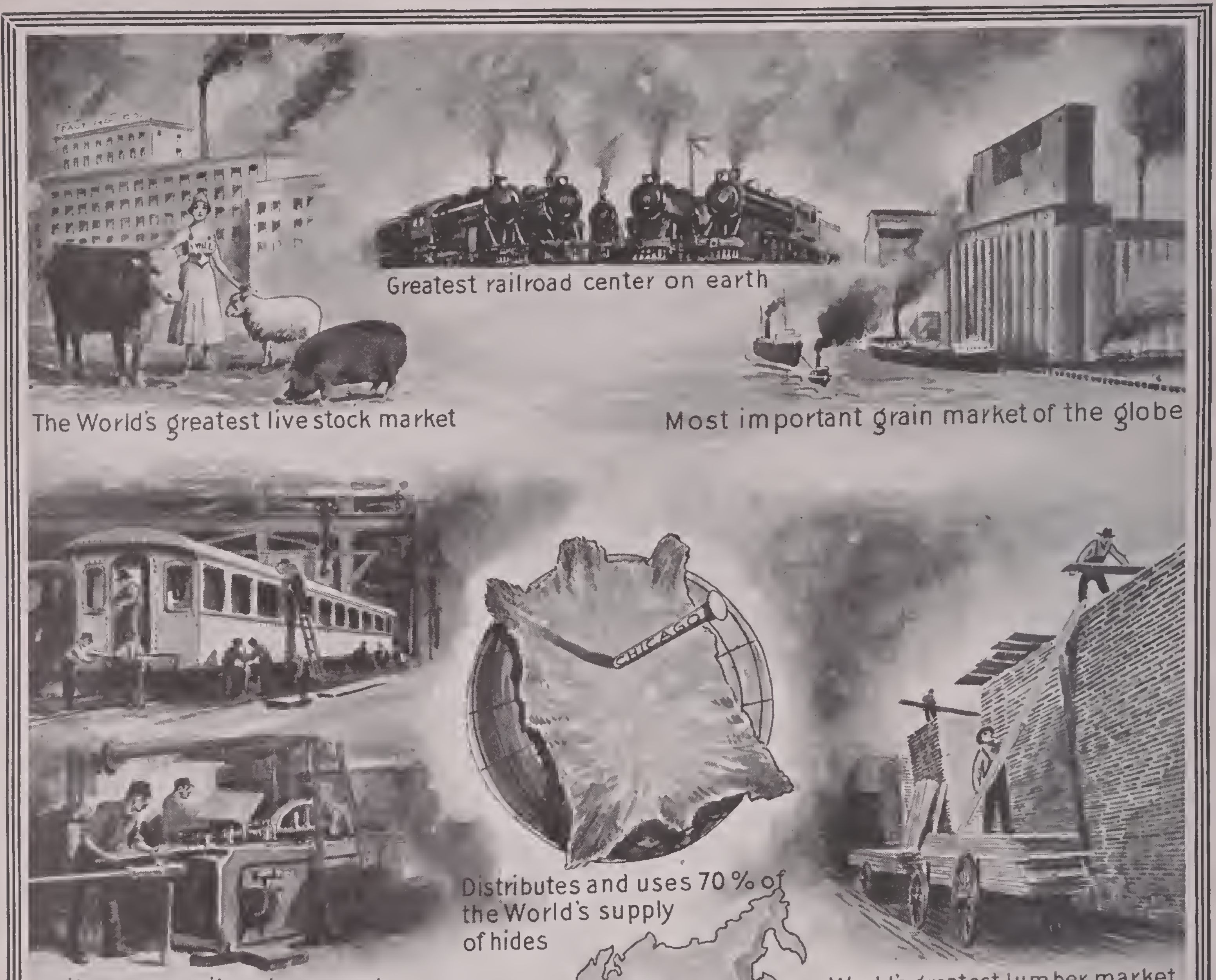
At the factories it is first chopped into fine bits and purified, then it is cooked in steam-jacketed vessels with sweetening and flavoring matter. Mint, wintergreen, pineapple, and licorice are favorite flavors, and pepsin and thymol are also added at times for medicinal purposes. The prepared "dough" is kneaded, rolled, cut into sticks, dried, and wrapped, all by machinery. Paraffin is largely used in cheap chewing gums; it may be detected by the tendency of the sticks to crumble.

The prevalence of the "chewing gum habit" in the United States has been criticized as inelegant, especially when practiced in public places. Those who defend the habit, however, say it is beneficial, not only because it is supposed to relieve mild cases of indigestion, but because it gives those who are nervously inclined "something to do," affording an outlet for their surplus energy.

WHERE THE KNEADING FOLLOWS THE COOKING

There is a curious "upsidedownness" in the world of gum. For instance, we chew food in order that we may swallow it, while, although we chew gum, we haven't the slightest intention of swallowing it; and while bread dough is always kneaded before it is baked, the kneading of gum dough takes place after it has been cooked, as is explained in the article.

SOME SUPERLATIVES OF CHICAGO THE GREAT


The World's greatest live stock market
Greatest railroad center on earth
Most important grain market of the globe
CHICAGO
Builds more railroad cars and machinery than any other city
Distributes and uses 70 % of the World's supply of hides
World's greatest lumber market
CHICAGO POST OFFICE
U.S. MAIL
Leads the World in furniture manufacture
Has more telephones than all Asia, Africa, and South America combined
Chicago handles eight times as much mail as the whole of Norway

Chicago is "the world's greatest" in so many activities that no artist could picture them all. A few of the most important are shown above. In judging of this record, you must remember that, less than a century ago, in 1837, when the city was incorporated, its population was only 4,000. As the United States grew and prospered, so grew Chicago, and today it stands perhaps the most typical of New World cities.

The GIANT INLAND METROPOLIS of AMERICA

Chicago's Famous "Lake Front" Seen from an Off-Shore Boat.

CHICAGO, ILL. The visitor who approaches Chicago from the lake front finds it difficult to realize that less than a century ago there was only a dreary swamp where now rises the mountainous skyline of the business district. He sees a city curving along the shores of the lake for nearly 25 miles, and continued to the north by beautiful residential suburbs, and to the south by manufacturing cities. Lincoln Park in the north and Jackson Park in the south show as vivid patches of grass and trees, with the great open space of Grant Park, the city's "front yard," in the center—all bordering on Lake Michigan.

If the visitor soars over the city in an airplane, he sees the Chicago River with its two branches dividing the city like a "Y," the mouth or entrance from the lake being at the base. Most of the great business buildings cluster in a tiny rectangle running seven blocks north and south, and five blocks east and west. This is the famous "Loop," girdled by a steel belt of elevated railways. Within this district, not more than a quarter of a square mile in area, a quarter of a million people work, and perhaps a million and a quarter more come every day to shop, transact business, and "see the sights."

A Spider-Web of Railways

Radiating from three sides of the Loop is a bewildering maze of railway lines, expanding into great "yards" and terminals. These are the barriers of steel which unite with the barriers of water to crowd central Chicago into an area far too small, constituting one of the chief problems with which the city now has to grapple. As the plane circles farther out from the Loop, great parks and a host of playgrounds are seen dotted here and there over the whole 200 square miles occupied by the city.

Such is the metropolis of the Mississippi Valley, which has grown within the memory of persons now living from a hamlet of less than 100 souls to be the second city of the United States and the fourth city of the world.

In 1830 Chicago was a cluster of log cabins in the midst of a marsh, huddled for protection close to the stockade of Fort Dearborn. Today Chicago is the world's greatest railway center, the terminus of nearly 30 lines, whose combined mileage is half that of the whole railroad system of the United States. It is the world's greatest live stock market and packing center, producing more than a quarter of the entire meat output of the country. It is one of the most important grain markets of the globe, and the prices paid for wheat on the Chicago Board of Trade largely determine the price of the world's bread.

Chicago a Great Port

The port of Chicago is the second port in the United States. It receives a greater volume of shipping than any but a few of the greatest world ocean ports, and more tonnage ascends the narrow Chicago River than passes through the Suez Canal. Seventy per cent of the world's supply of hides is used or distributed in the Chicago district; and this same district handles more lumber, makes more machinery, builds more railway cars, and manufactures more furniture than any other place on the globe. It is the center of the agricultural implement industry which has revolutionized the farming methods of the world. It is the greatest distributing center in the country for dry goods, foodstuffs, clothing, pianos, household requisites, and general merchandise. For Chicago, besides leading the world in certain industries, has greatly diversified interests, and is among the most important centers for the manufacture of automobiles, baking powder, boots and shoes, brass, copper, tin, and sheet-iron products, bakery products, carriages and wagons, confectionery, electrical machinery, foundry products, iron and steel, paints and varnishes, soap, tobacco, and a host of other things.

To appreciate fully the bewildering vastness of this young city, one must remember that it has more miles of streets than some states have of roads; that it has more telephones than all Asia, Africa, and South America combined. It handles more freight and spends more money for governmental purposes than some European nations. Its post-office handles eight times as much mail as all Norway. It has more

A NEWCOMER WALKING UP STATE STREET IN 1836

You have heard so much about Chicago's famous State Street. Can you imagine that not so long ago it looked like this? The scene is in 1836, when John Wentworth, who later became a prominent Chicago citizen, came to town carrying his shoes in his hand and all his worldly goods except the clothes on his back wrapped into a bundle and slung over his shoulder at the end of a stick. In the picture he is shown passing the house owned by the editor of the Chicago Weekly Democrat, the city's leading paper of those days.

people than any of 36 states, and more churches than any of 13. The busiest street corner on the globe, the largest department store, and one of the largest art schools are all found in Chicago.

The population is as varied as the industries. No less than 35 distinct nationalities have gone to the city's making, and 1,700,000 of its more than 2,700,000 inhabitants are of foreign birth or descent. Every important racial group in Europe is represented here, notably the northern nations—Norway, Sweden, Russia, Denmark, the Netherlands, Germany, and Austria—whose people find the climate of Chicago especially congenial. Chicago has therefore become the country's greatest clearing-house for labor.

THE SAME STREET AS IT LOOKS TODAY

Now see what less than a century has done! Instead of a country road we see one of the busiest streets in the world; instead of one barefoot young man we see thousands of well-dressed people hurrying about their business or pleasure. Even the boldest of prophets would not have dared to predict such a development.

SUPERB STATUARY FOR A GREAT PARK

In order to make sure that his "Fountain of Time" would harmonize with its background, Lorado Taft, the sculptor, erected a full-size plaster model on the site of the fountain at the point where the Midway boulevard enters Washington Park. This fountain is one of the many famous works of art contributed by Chicagoans to beautify their city.

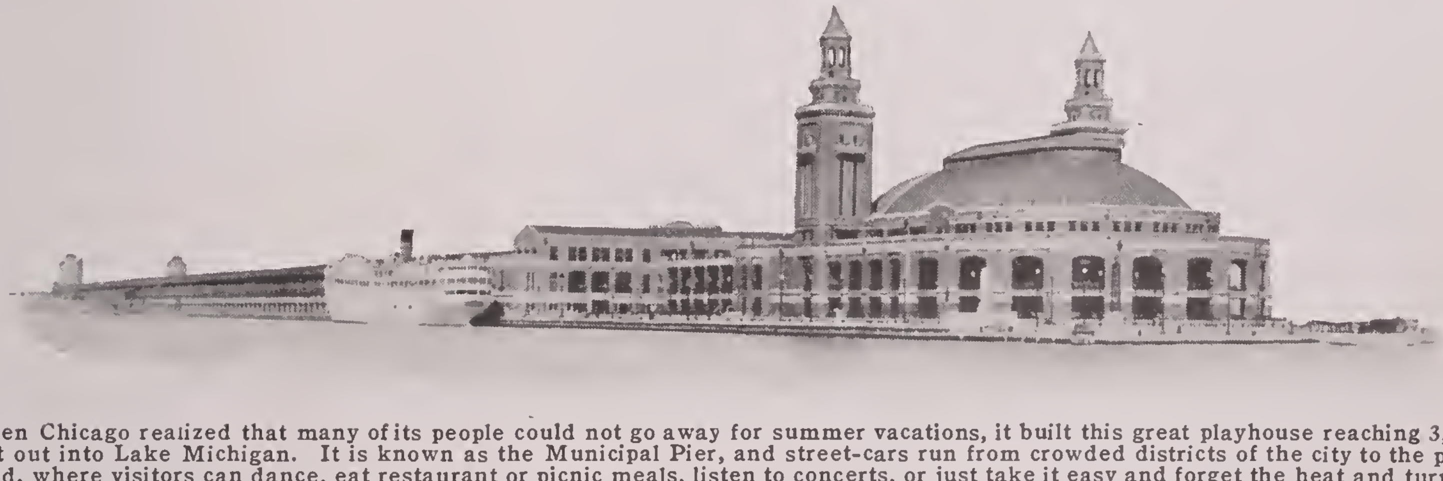
Chicago has verified the prophecy uttered by La Salle, one of the first white men to view its site, who said: "This will be the gate of empire, this the seat of commerce." The keen eye of that explorer saw the natural advantages that have made Chicago what it is. For Chicago did not "just happen." Its site was marked out from the earliest days to be the inland metropolis of America.

How the "Crossroads" Made Chicago

Situated at the foot of the Great Lakes, where the long arm of Lake Michigan thrusts far down into the heart of the Middle West, it has a commanding position as a point of trans-shipment between water and land transportation. It is the terminus of a water route to the St. Lawrence which reaches through to the Atlantic seaboard. It lies astride of the natural land routes between West and East, which are forced by the sprawling length of Lake Michigan to bend around its southern end and thus to converge at this point. As a result, every railway which enters this region naturally makes Chicago its terminus, so that the city today is like the hub of a wheel with railways radiating in every direction.

Chicago is thus the gigantic "crossroads" through which the products of the industrial East and the manufacturing West must pass; it is also the gateway between the ore-producing North and the cotton-growing South. It is the natural commercial focus of the great Mississippi Valley, with its stretch of marvelously fertile soil as large as half Europe and its prosperous population of 50,000,000 people.

THE PEOPLE'S MAGNIFICENT PLAYHOUSE SET IN THE LAKE



When Chicago realized that many of its people could not go away for summer vacations, it built this great playhouse reaching 3,000 feet out into Lake Michigan. It is known as the Municipal Pier, and street-cars run from crowded districts of the city to the pier-head, where visitors can dance, eat restaurant or picnic meals, listen to concerts, or just take it easy and forget the heat and turmoil of the city. It is also a landing place for freight and passenger steamers.

The extensive coal mines of Illinois and Indiana furnish it fuel, while the cheapest water transportation in the world brings iron ores from Lake Superior. Steel is made here more cheaply than at Pittsburgh. Lumber and copper come from the same nearby sources. Lead, zinc, and other minerals reach Chicago in abundance from the Southern states.

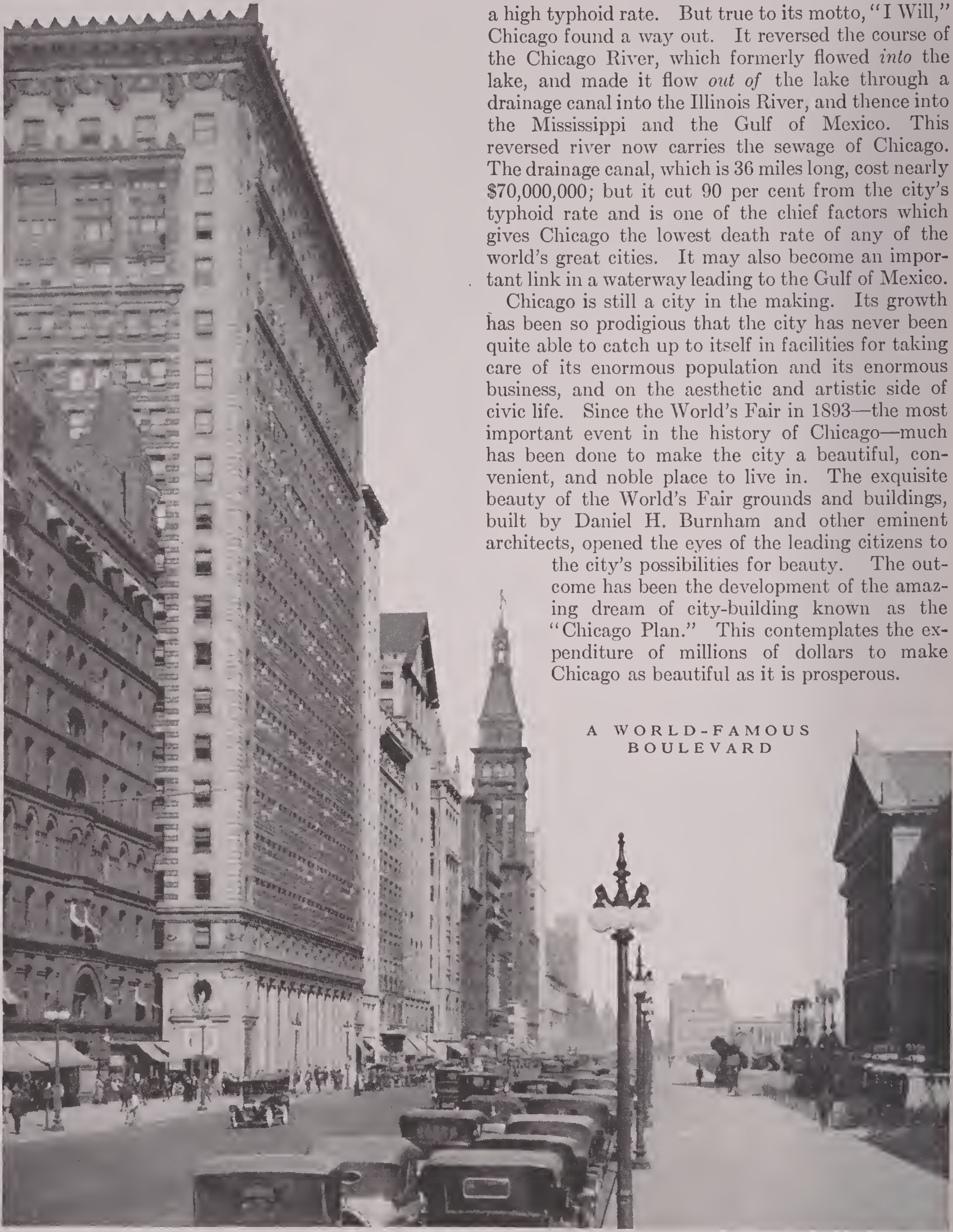
An inexhaustible water supply lies at its door. New York has to bring water from sources 50 and 100 miles distant, but Chicago needs only to erect pumping stations. It has thus become the home of heavy manufactures which use great quantities of water. With less than half as many inhabitants as New York, Chicago uses more water than that city. The combined length of its water and sewer mains is longer than the combined length of the Ohio, Mississippi, and Missouri rivers.

Why Chicago Turned Her River Around

The problem of sewage disposal is more difficult. Formerly Chicago emptied its sewage into the lake and drank the contaminated water. The result was a high typhoid rate. But true to its motto, "I Will," Chicago found a way out. It reversed the course of the Chicago River, which formerly flowed *into* the lake, and made it flow *out of* the lake through a drainage canal into the Illinois River, and thence into the Mississippi and the Gulf of Mexico. This reversed river now carries the sewage of Chicago. The drainage canal, which is 36 miles long, cost nearly $70,000,000; but it cut 90 per cent from the city's typhoid rate and is one of the chief factors which gives Chicago the lowest death rate of any of the world's great cities. It may also become an important link in a waterway leading to the Gulf of Mexico.

Chicago is still a city in the making. Its growth has been so prodigious that the city has never been quite able to catch up to itself in facilities for taking care of its enormous population and its enormous business, and on the aesthetic and artistic side of civic life. Since the World's Fair in 1893—the most important event in the history of Chicago—much has been done to make the city a beautiful, convenient, and noble place to live in. The exquisite beauty of the World's Fair grounds and buildings, built by Daniel H. Burnham and other eminent architects, opened the eyes of the leading citizens to the city's possibilities for beauty. The outcome has been the development of the amazing dream of city-building known as the "Chicago Plan." This contemplates the expenditure of millions of dollars to make Chicago as beautiful as it is prosperous.

A WORLD-FAMOUS BOULEVARD



Few streets in the world are as interesting as Michigan Boulevard, Chicago, shown above. The boulevard is the "front yard" for the heart of the city, for it skirts the edge of Chicago's crowded "Loop" district. It is a "one-sided" thoroughfare, for the Art Institute, just visible at the right, is the only building for a stretch of 10 blocks on the eastern side of the boulevard. Instead the view carries over the open stretches of Grant Park, across the sunken railroad tracks, to the lake. Michigan Boulevard leads away to the north to a magnificent system of broad streets and boulevards. All day long streams of automobiles speed up and down its smooth course, and on the sidewalks the crowds parade, particularly in summer, when cool breezes blow from the lake.

LIKE THE PLEASURE GARDENS OF A KING

Out of the smoke and crowds of Chicago's vast business districts, come the people in their spare hours to enjoy the city's beautiful parks. This view shows the Conservatory and formal flower garden in Lincoln Park, on the north side of the city. The Zoölogical Gardens are just beyond the trees to the right of the picture, and a large boating lagoon lies behind the Conservatory.

Chicago's artistic and intellectual life is already as keen as that of any city in the United States. It has six famous libraries; its Art Institute is visited by a million people every year; its four chief universities in the city and suburbs enroll over 15,000 students; the Field Columbian Museum, housed in an $8,000,000 building on the lake front, is the best museum of anthropology, ethnology, and the industrial arts in the United States. Chicago is also the musical and artistic center of the West, with a symphony orchestra founded by Theodore Thomas, and a season of grand opera not surpassed in brilliancy anywhere in America.

And this position Chicago has attained in the face of appalling obstacles. First, it had to pull itself out of the mud. Its marshy site was so unhealthful that in the '50's the death rate was high enough to wipe out the whole population in four decades. Chicago girded itself to the task and raised the level of the whole city between 12 and 14 feet, filling the marsh with limestone and sand and rubbish. For the first time in history, jackscrews were used to lift 4-story buildings while business proceeded uninterrupted.

Then, in 1871, came the Great Fire, which wiped out $200,000,000 worth of property and left more than three square miles in ruins. Within two years the whole area was rebuilt on a plan much finer than before. By the middle of the next decade the congestion in the business district had spurred Chicago architects to devise the steel-frame skyscraper, which has since revolutionized the building methods of the world (*see* Building Construction.)

The history of Chicago begins with 1777, when a San Domingo colored man built a hut on the Chicago River. This was the point where the Indians used to leave the lake to travel to the Mississippi by the route of the Chicago, Des Plaines, and Illinois rivers. In 1803 John Kinzie, the first white settler, bought the hut and conducted from it his trading with the Indians. The next year the United States built a stockade near by, known as Fort Dearborn. In 1812, during the war with Great Britain, General Hull, who was in command of the British forces at Detroit, ordered the fort to be evacuated. The little body of settlers set out with their women and children around the foot of the lake, but before they had gone more than three miles they were attacked by a band of Indians and the whole body captured or killed. After the war the settlement was soon rebuilt; and by 1837, when the city was incorporated, the population had mounted past the 4,000 mark. The commercial importance of the city was assured in 1848, when the Illinois and Michigan Canal was built, making an all-water route to the Mississippi by way of the old Indian portage.

ONE OF THE CITY'S MANY CHURCHES

This is the Fourth Presbyterian Church, standing in the midst of Chicago's fashionable north side "Gold Coast." With its cloister and other attached buildings, it has a suggestion of the charm that attaches to Europe's monasteries.

Lost in CHICAGO

ONCE a little boy was lost in Chicago. That's nothing new, you think. A little boy is often lost in Chicago, and in every other big city in the world. His mother just tells the police about it, and sometimes he is found right away. If he isn't, the newspapers help find him by printing his picture. He is always scared and sorry, and promises that he will never, never wander away from home and get lost again.

This isn't that kind of a story. It happened more than two hundred years ago, when no one but Indians lived where Chicago stands today. The ground that is now covered by the city was a flat marshy prairie, 10 miles wide, and stretching for 25 miles along the low sandy shore of Lake Michigan. Around the northern and western edge of this plain circled a ridge of wooded hills. In the southwest near the ridge was a low place filled with muddy water, called Mud Lake.

On the Great Chicago Plain

The Chicago plain was only a foot or two higher than Lake Michigan, so it was flooded every spring by rain and melted snow. In summer it was a wild meadow, green and blossomy. Herds of deer and buffalo came to feed on the grasses. Tribes of Indians came to plant corn, fish, and shoot ducks.

The Indians always stayed for the fall hunting. The brown grass was then so tall, all over the prairie, that they could slip through it and get very close to game without being seen. But with the first snowfall the animals and Indians both moved to the shelter of the woods. In winter bitter winds blew across the Chicago plain, and the snow was heaped in deep drifts. The stormy lake rolled up in great billows over the frozen sand-bars.

Now, what kind of a place do you think that was for a little white boy to get lost in? Especially in October, when the grass was higher than any little ten-year-old boy's head?

He was a French boy named Louis Jean de Muys. The very first white men in this part of America were French. Louis Jean's father was an officer in a French fort on Starved Rock. That was a high rocky bluff on the Illinois River, a hundred miles west of the Chicago plain. Perhaps his mother had died. Anyhow, for some very good reason, Louis Jean had to come all the way from Montreal, Canada, to join his father.

He came with Henry de Tonty, commander of the fort on Starved Rock, and one of the truest heroes ever in the wilderness of Illinois. He had been there for nearly 20 years, so he knew the country as well as any Indian. In a letter, Louis Jean's father had told him that it would not be safe for such a little boy to make that long, wild journey, except in charge of this brave soldier of France. He must give the strictest obedience to Monsieur de Tonty. "Monsieur" is the French name for *Mister*. Monsieur de Tonty loved Louis Jean and called him "my son."

It was a fine big party that left Montreal. There were four missionary priests going out to preach to the Indians, and several French-Canadian fur trappers. The fleet of big canoes, loaded with supplies for the distant fort, was paddled by Indians who loved the French. For more than a thousand miles Monsieur de Tonty led the party over the waters of four vast lakes as big as seas. At last the canoes turned out of Lake Michigan into the Chicago River.

Down the south fork of this Y-shaped stream they paddled to Mud Lake. They were glad to find there a big village of friendly Miami Indians. The canoes and goods had to be carried from there nine miles, over the wooded hills, to the bank of the Des Plaines River, which flowed westward into the Illinois River. Even with the help of the village Indians there were two weeks of the hardest kind of work, for there were no ponies. Everything had to be carried on the men's backs.

As Louis Jean was too small to help, he had a fine time with the Indian boys. He learned to play the ball game of lacrosse. He paddled a canoe around Mud Lake and fished with a bone hook.

One morning the carrying was all done and half the men were with the reloaded canoes on the Des Plaines. The rest made ready to join them. Louis Jean had nothing to do, so he was ready among the first. Monsieur de Tonty had to make a speech and give presents to the Miamis, who had fed and lodged the whole party and helped in the carrying. The little boy was impatient.

"Monsieur de Tonty," he said politely, "I'll go on ahead."

"No, my son, you will wait," said his guardian, kindly but firmly.

Waiting was hard. A tiresome Indian orator talked and talked and talked. It was a bright October morning. The high brown grass, thick with purple and yellow flowers, rolled in waves under the wind. The circling forest-covered ridge made one long billow of crimson and gold. And there lay the old Indian trail to the West, worn deep in the soft earth by many moccasined feet. Louis Jean thought it would be a very stupid boy who could not follow that plain path.

"I'm not a baby, who has to be watched every minute; I can look after myself," he said.

It was easy for him to run around the wigwams and slip out of the village. As soon as he was on the trail the tall grass hid him. It made a wall on either side and closed behind him. For the first half-mile the beaten path was plainly marked. Then it ran into a swamp. But there were footprints in the mud, so Louis Jean went on. He waded boldly across a small pond and found tracks on the other side. There they stopped. He had missed the trail! He turned at once and tried to find his way back to the pond.

LOUIS JEAN BY THE CAMPFIRE

During the long evenings of the canoe journey from Montreal to Chicago, Monsieur de Tonty told his little friend many wonderful stories of the country—its Indians, animals, and riches. From these stories Louis Jean learned to love the Great Lakes country, and not even his terrible Chicago adventure dampened his enthusiasm for living there.

Suddenly he knew he was lost in that sea of prairie grass. He could see nothing except the sky above him. There were no trees to climb. Badly frightened he struggled on, trying to find the pond or the trail. He stumbled over rough hummocks. He splashed into deep mud holes. The wiry grass tangled around his feet. The dusty seeds, blowing in the wind, hurt his nose and throat.

After a long time he heard a gunshot. He had been missed in the village and men were out looking for him. He should have stood perfectly still and waited, but in a panic of fright he ran toward every report of a gun that he heard. He shouted until his voice was only a hoarse whisper. The searchers had scattered. The shots sounded farther and farther away. At night Louis Jean sank down in the grass and sobbed himself to sleep.

Monsieur de Tonty sent half the men on to the fort with the goods. He stayed to hunt for the little lost boy. Soldiers, trappers, and Indians divided into small bands, and scattered over that 250 square miles of prairie. Louis Jean's footprints were found in muddy places. But the grass was so trampled by wild herds that even the Indians could not follow his wanderings.

After three days everyone thought he must be dead. So many terrible things could have happened to him. He might have fallen into the river. He might have been knocked down and trampled by a herd of deer, or gored by a bull buffalo. He might easily have starved. There were gray wolves in the timber that came out at night to hunt helpless animals. And any day that dry prairie might be set on fire by a spark from the campfire of a band of hunters. Miami braves got into their canoes and paddled up and down the river to warn every village of Indians that a little French boy was lost in the tall grass.

Louis Jean in the Kickapoo Tent

That was how Louis Jean was found, after two long dreadful weeks of search. He was in a village of Kickapoo Indians, ten miles up on the north fork of the Chicago River. A band of Kickapoo hunters had found him when he was almost starved and quite out of his mind. They did not know where he had come from, and he could not tell them.

Monsieur de Tonty found him lying on a pile of skins, in a rude tent-shaped tepee of poles and buffalo hides—for the Kickapoos were one of the poorest of the prairie tribes. They thought the handsome white boy was an angel from heaven. The squaws had taken as good care of him as they knew how. Medicine men had danced and shouted around his bed, to scare the evil spirits of his sickness away. Yet he lay in a burning fever, talking wildly. Monsieur de Tonty's eyes filled with tears as he and a missionary priest carried the unconscious boy to a blanket bed in a Miami canoe.

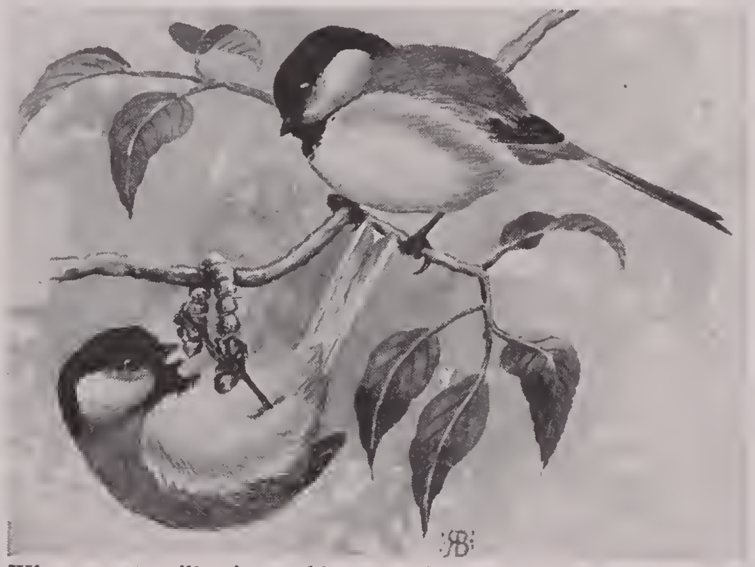
As fast as men and canoes could travel he was taken down to the fort on Starved Rock, where there was a French army doctor. There the boy was slowly nursed back to health and strength. It was Christmas before he was well again.

So Louis Jean Learned His Lesson!

Louis Jean wanted to be a gentleman and a soldier of the king when he grew up. So he knew exactly what he had to do now without being told. He was a Catholic, so he went to a priest in his little bark chapel in the village of Illinois Indians, near the fort. There he confessed his great sin of disobedience. Then he begged the forgiveness of his father and of Monsieur de Tonty for all the sorrow and trouble he had caused. He would never forget his terrible punishment, and never, never disobey orders again.

CHICKADEE. "Off again, on again, gone again!" That's the nimble chickadee, who picks his lunch from the bark of your dooryard tree or accepts the bounty from your window sill, stopping now and then for a few acrobatic stunts or to call on bird neighbors to share his good cheer. Winter or summer, it's all the same to this hardy little bird. He stays with us the year 'round.

HOW THE CHICKADEE SWINGS ON HIS DINNER



When a caterpillar is too big to hold under one foot, the chickadee draws it over a twig and, holding both ends with his feet, pecks away at it.

Mr. and Mrs. Chickadee make the most of their 5¾ inches of length. Their gray coat and white vest are set off by a black cap and cravat; the sharp little bill and bright eyes give them just the pert expression that suits their blithe manner; and the shiny black of their slender legs and feet is the finishing touch to their smart costume (for illustration in colors *see* article on Birds). The call, *chick-a-dee-dee-dee*, is given in just the high clear tone one would expect from such cheerful fellows, and their tender mating call is as sweet as any love song in birdland.

Like other members of the Titmouse family (*see* Titmouse), chickadees are of great service to the farmer, for they eat insects, from tiny plant-lice to larvae so large that the tiny birds can master them only by hanging the caterpillars across a twig, seizing an end in each claw and swinging underneath, back downward, until the weight breaks the tough skin of their prey. Scientific name of common chickadee, *Penthestes atricapillus*.

CHILD LABOR LAWS. In the early days of the 19th century, great machines were invented in England to do the work that was formerly done by hand at home, and great factories were built to house the machines. All that was needed was workers to tend these great iron monsters and feed into them the carded cotton that came out as thread, to be spun into cloth. But many Englishmen were away at war fighting Napoleon, and someone discovered that little children could do much of the work about the machines as well as grown men; and so the manufacturers were advised to "take the children." So they took the children when they were seven years old; they took them when they were six years old; and sometimes they even took them when they were only four years old. They crowded them into factories where there was barely room for the little bodies to slip between the great whirring wheels and under the swiftly moving belts. They worked them 12, 14, and sometimes even 15 hours a day, and they kept overseers to whip them if they became drowsy and made mistakes. The children became stunted and deformed and sick. One out of every three or four was killed or crippled for life. But the manufacturers could go to the orphanages and the poorhouses and get more. Only they must take one idiot child for every 20 strong and healthy ones. But then, even a feeble-minded child could do something, and the rags that they wore and the food that they ate did not cost much. Even worse was the life led by the children who worked in the coal mines.

And while this was going on in England, Parliament was prohibiting the African slave-trade and preparing to abolish slavery in the West Indies; though, as the poet Robert Southey wrote, "The slave trade was mercy compared with the child-trade in factories."

"The Cry of the Children"

Finally the attention of the good people of England was called to these terrible conditions in their own land. Elizabeth Barrett Browning wrote her pathetic poem 'The Cry of the Children', in which she described these children grown "old beyond their years." And Lord Shaftsbury, Richard Oastler, and others began their agitation in Parliament to save the child-slaves of England. It was a long fight and a hard fight. The manufacturers did not want to give up the profitable labor of the children if they could help it, and many well-meaning people were blinded by maxims to the effect that "government should not interfere with industry." At first the best that could be done was to procure a law prohibiting the work of children under 9 years of age, and limiting the hours of those under 16 to 12 hours a day. But the fight was kept up, and today no child under 12 years of age can be employed in factory or mine in England, and the hours and conditions of labor of those above that age are strictly regulated by law.

Child Labor Laws in the United States

Other countries have followed in the footsteps of England in protecting their children. In the United States practically all of the states have such laws. In many manufacturing states of the North, children under 14 are not allowed to work at all, while those between 14 and 16 must get a permit to do so, and their hours are limited. By such laws as these and by others requiring children to go to school, the nations are saving their boys and girls, so that they may become useful men and women. (*See* Factories and Factory Laws.)

A WISE PARENT *makes a* WELL-TRAINED CHILD

"KEEP the Babies Alive!"—"Make and Keep Children Well!"—"Make More Children Worth While!" These are the slogans of the child-saving and child-training campaigns which go far to make the 20th century pre-eminently the century of the child. We all know that time and patience are needed to rightly train a dog or a horse. How much more are they necessary to train a human child, so that it may grow into a strong, helpful, noble man or woman—and how much greater is the reward! This article, by one of America's leading specialists on Child Training, shows by specific instances some things for parents to do, and some to avoid, in the great work of bringing up a child in the way he should go.

CHILD TRAINING. This 20th century has been called the century of the child. Not that there weren't plenty of children before the year 1900! What indeed would the world have been worth without them? Some of them had a healthy, happy, and busy childhood and grew into strong, honorable, and successful men and women. But many people wished for that kind of childhood for *all* the children of the new century.

The doctors and nurses began the work. They said it is cruel and senseless that one out of every seven babies dies before its first birthday. Soon countless parents learned how to care for their babies so they lived comfortably through that hard first year of life. Then the doctors and nurses, helped by the teachers, said it is wrong to expect children who are uncomfortable to study hard and behave well at school. Now, parents are glad that they know it pays in many ways to have their children freed from eye-strain, toothache, poor breathing, wrong eating, or sleeping in un-aired rooms.

Other students of child life helped too. They insisted that children had a right to happy healthy minds. And thoughtless parents learned how mistaken they had been in frightening their children or poking fun at them or punishing them in wrong ways. So three big campaigns for children were started. Their slogans were, "Keep the babies alive," "Make and keep children well," "Make more children worth while." It is no longer enough to *love* one's babies and children *dearly*. One must love them *wisely;* more wisely than the parents of a certain Little Boy.

He was so well cared for that he was physically quite perfect. Often when he tried to do what his father and mother did, he was so very cunning that a great fuss was made over him. When he was 3½ years old, the guest room in the house was being re-decorated. Little Boy had a wonderful time watching the paperhangers at work.

When they went, came two women who cut and sewed crisp white and bright flowery cloth. Little Boy did not know that this was one way of making pretty curtains for bedroom windows. One afternoon he found the women gone. The white and flowery cloth and the shining shears were still there. Soon Little Boy was as busy as the women had been. And then!—then his mother came into the room, and because she did not understand that her Little Boy could not have done otherwise than try to do what he had seen the women do, she said dreadful things to him in an awful voice he had never heard before. She spanked him hard and put him to bed before his father came home. She gave his delicate nervous system and his love for her their first terrible shock.

In a few days she found it easy to speak to and punish him again in this terrifying way. Thereafter she did it very often, though she could not see any improvement in his behavior. But she kept right on until—until he was seven years old. Then she took him to a great doctor, a specialist in nervous diseases. He shook his head over the signs of St. Vitus dance. But the great doctor could not cure him. He could not unlive Little Boy's life down to the time he was 3½ years old. Nor could he give him a new mother wise enough to know that her son was neither naughty nor destructive in cutting her curtains.

What "Little Boy's" Mother Should Have Done

The wise mother would have given Little Boy a small pair of shining scissors, some pretty cloth and paper, and taught him they were all *his own* to cut, while *her curtains* were being made by the women.

All normal healthy children must be busy. They will often try to do what they see their elders doing. They will sometimes make mistakes. These mistakes may cost the parents extra money. But ruined bedroom curtains can be replaced with a small outlay; a ruined nervous system and shattered affections are usually beyond repair, though much money may be spent upon them. Dr. John Watson, of Johns Hopkins Medical School, says, "I have said more than once that I believe I could make or break a youngster in the first four years of its life; that is, without abusing it or starving it or otherwise being cruel to it, I could twist, thwart, over- or underdevelop its instinctive and emotional life to such a degree that it would never recover from it."

Parents must look behind every deed for the child's meaning before jumping to hasty scolding or harsh punishment. Even behind very cruel-looking deeds may lie only an innocent intention on the part of ignorant childhood. Some boys were once found pounding a cat against a barn door. To a sympathetic question from a grown-up that was passing they answered: "We've been told that cats have nine lives and we're going to find out whether it is true." These boys were told the meaning of this old remark. They learned that the cat suffered pain even as they would from a pounding. Their behavior towards cats became the right one.

All normal healthy children are busy, are affectionate, and are curious. When their busyness, affections, or curiosity lead them astray they should not be severely punished. Instead, their mistakes should be explained and if possible they should be given a chance to make up for them.

How Little People Discover Their World

The campaign to "Make more children worth while" helps parents to understand that children must be physically busy, emotionally sensitive, and intellectually active. For these are the three important natural kinds of behaving. Each shows itself in many different ways. All together they are called non-learned behavior. No one has to teach children these ways of behaving. Parents should watch for them to give them a chance to develop. Without them no baby growing into childhood could ever learn to do or to feel or to know anything. This would be true even though the wisest persons in the world were the baby's parents and teachers.

So when the tiny baby throws his hands about, kicks up his feet, and makes strange noises with his voice his parents must not stop him. Later they must let him shake his rattle, open and shut a convenient box or drawers a dozen times or more.

He is doing these things because he has inherited a general instinct to physical activity. All of their own accord some muscles and their controlling nerve centers are ready for exercise. Some energy stored up in the child's nervous system because of good food and restful sleep is trying to find its way out in movements.

A young professor's wife did not know this. That is why she told her son that he must not climb the stairs, that he would fall and hurt himself. But some of the boy's muscles and nerve centers were just ready for that new and hard behavior, so he kept on trying. Now he didn't fall, so he didn't hurt himself; and he wasn't at all disobedient as his mother sometimes thought. There was another professor's wife who was wiser. When her babies were ready to climb stairs, she seated herself near by with her sewing. She cautioned the children to be careful, she praised them and laughed with them when they were successful. Each of her children mastered stair climbing in half-a-day without tumbles and bumps.

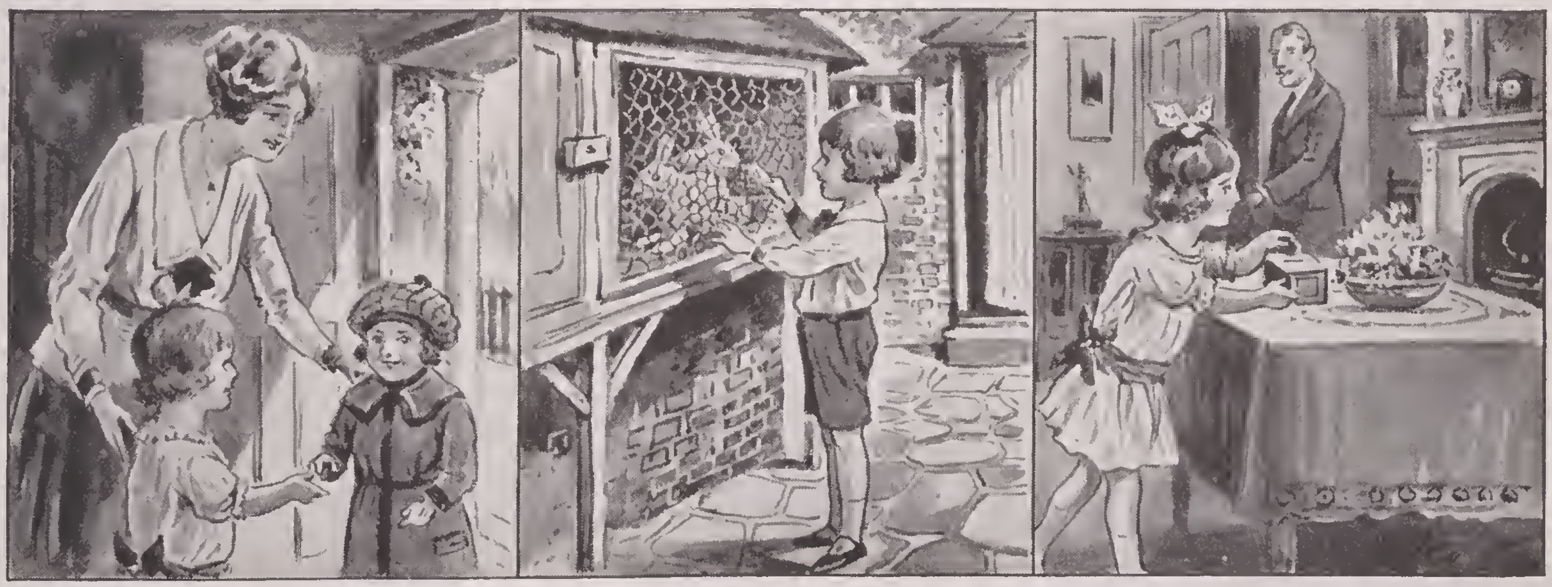
Learning to be "Self-Helpful"

There are parents and nurses who do not interfere with the ways in which babies must satisfy natural muscle and nerve hunger. Instead they train their children to be physically independent and self-helpful. That is the reason Jane at 3½ years could put on, without help, her tights, her tall buckled overshoes, her sweater, her coat with its buttonholes in a blind flap, her cap and her mittens when ready to play outdoors. That is why Mary Louise at four offered to take home the small kindergarten doll, find some scraps of cloth, needles, thread, and pins to make a dress for it. Mary Louise's eyes sparkled and her face was wreathed in smiles when she brought back the doll she had dressed all alone. But Margaret,

SOME IDEAS THAT HELP IN TRAINING A CHILD

Every child will form useful habits if its parents will guide its interest into the right channels instead of giving orders. The mother who suggests other interesting exercises when her boy slides down the banisters can get him to forget this dangerous sport, which is much better than saying "Don't!" If the mother helps when the little girl wants to make doll dresses, the little girl soon gets interested in sewing. Every child offers to help about the house from time to time. If the mother accepts these offers the child soon acquires skill and forms the habit of doing its part in the duties of the home.

Another good rule is to let the child follow its likes as much as possible. If it wants to make noise, let it—in the proper place—and it will grow up with a cheerful disposition. Even in the same family, two little girls will amuse themselves in different ways. They will develop stronger characters in this way than if their mother tries to make them be alike. The boy who chooses his own toys will develop more self-reliance than one whose toys are chosen for him.



The child that is encouraged to play with other children will know how to make friends when grown up. The child who learns to care for animal pets will develop sympathy and kindness; while the little girl who is taught to save her pennies will be able to spend her dollars wisely when she has a home of her own to manage. This sort of training takes time and patience; but it produces much better results than the system of laying down a lot of rules and expecting the child to appreciate the wisdom of them.

who was five, didn't have shining eyes and a smiling face when she brought back the other little doll. Her mother had carefully made a neat romper suit which lasted longer than the dress made by Mary Louise. But Margaret's muscles and nerve centers and feelings and ideas were all robbed of a chance for the exercise for which they hungered.

This mother is no longer taking such opportunities away from Margaret, for the kindergartner and the doctor explained to her the reason of Margaret's slow ways and her cheerless face.

How Much These Busybodies Learn!

Every child has a right to the training in the home that makes him able to do things well by correct use of his body, arms, and legs in games and work and by use of the common tools of the house, the garden, and the carpenter's bench. More and more psychologists and teachers are saying that the most successful education in the first nine years of every child's life is that which comes through using his instincts to physical activity; through the use, at the right time, of muscles and nerves in some valuable exercise.

Your child, our children, will sometimes wish not to follow exactly in our footsteps. Friction can and should be avoided by considering whether our ways are the only right ways. The chances are that in the beginning our children will want to do differently about very minor things. They must find after trying their ways that they were mistaken, or—and this sometimes happens—we, the parents, may find that we were wrong.

But the tendency to have right kinds of feelings must also have its chances for growth. Parents so often complain of the selfishness of the children as they grow older. At a time when they should show their gratitude in cheerful helpfulness, they fail.

Nine times out of ten such parents have only themselves to blame. They were the ones who stopped the little puttering child when he first wanted to help his parents work. These first feelings of helpfulness are made weak through lack of use. They can be strengthened by early and frequent exercise.

Little Housekeepers and Their Work

Mildred and Andrew woke up one morning remembering that a great day was before them: their kindergarten teacher was coming to luncheon. "What can we do to help get ready for her?" they asked at breakfast. The mother was a careful keeper of children as well as a careful housekeeper. She suggested that they make the bed upon which the teacher would lay her wraps. Mother left the bed just as the children had made it though it was not made so perfectly as she could have made it.

Ruth, a girl of 14, is the eldest of four children. She shares in all the household work cheerfully and efficiently. Ruth can and does bake the waffles every Sunday morning; she can and sometimes does prepare and serve an entire meal for parents and their guests. She is a successful student at school. The chances are 999 out of a 1,000 that her parents will always be able to count on her because the feelings that lead to helpfulness and comforting were exercised in the right ways from their very first appearance.

Our problem as parents is just one of making up our minds early what feelings we wish our children to express as they grow older. Next, it is one of planning how to strengthen those feelings, and the actions and ideas that go with them through frequent use. Is it disobedience or obedience that we wish in our homes? Do we wish to obey the children or have them obey us? Or should we and they obey something bigger than either? The first lesson in feelings leading to obedience should be of the right kind.

A clergyman's wife was training her boy to obey her. She did it by standing with her arms stretched over the banisters. In her hands she held the little baby sister whom she would threaten to drop to the first floor when the son of five did not do as he was asked. None but a weak or uninformed parent ever uses such a threat. The child is bound to find out that such a deed cannot be done. Then both old and new threats cease to have any power to scare him into obedience. It is never right, nor ever necessary, to threaten dreadful or foolish things in training children.

Why Ellen Always Got Her Way

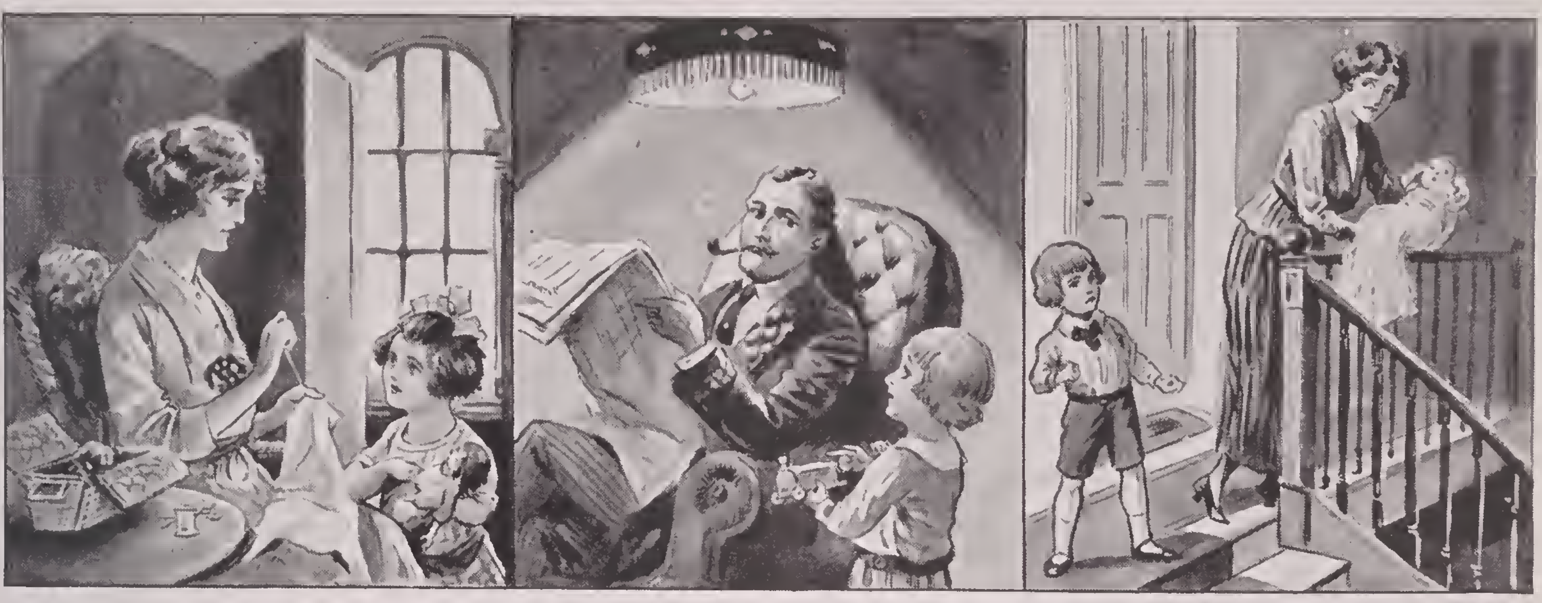
Neither is it right to let children develop the feelings that lead them to expect their parents to give in to them. These feelings show themselves in infancy; they go with actions and they start ideas in the baby's mind very early. Parents do not know of their existence until the child shows them in pouts and tantrums. Unfortunately some parents expect that children will outgrow their bad feelings and actions. As a rule they grow in more firmly. That is why children, some very young and some older, can make their parents give into them on almost any issue.

Ellen, who was ten, could do it. She was having a fine time after supper talking to her father's guest and one-time teacher, the dean of a college. To please her, the dean rose early so they could talk before breakfast. It was then she told him of her desire to drive to town with him and her parents. "But," she said, "when I ask Mother to let me go she will say, 'Oh no, not to-day.' Then I will tease until she says, 'No, I can't be bothered with you this time.' Next I'll begin to whine and then she'll scold. Then I'll bellow and she'll say, 'Well, if you must, you must. Get ready so that you don't keep us waiting.' "

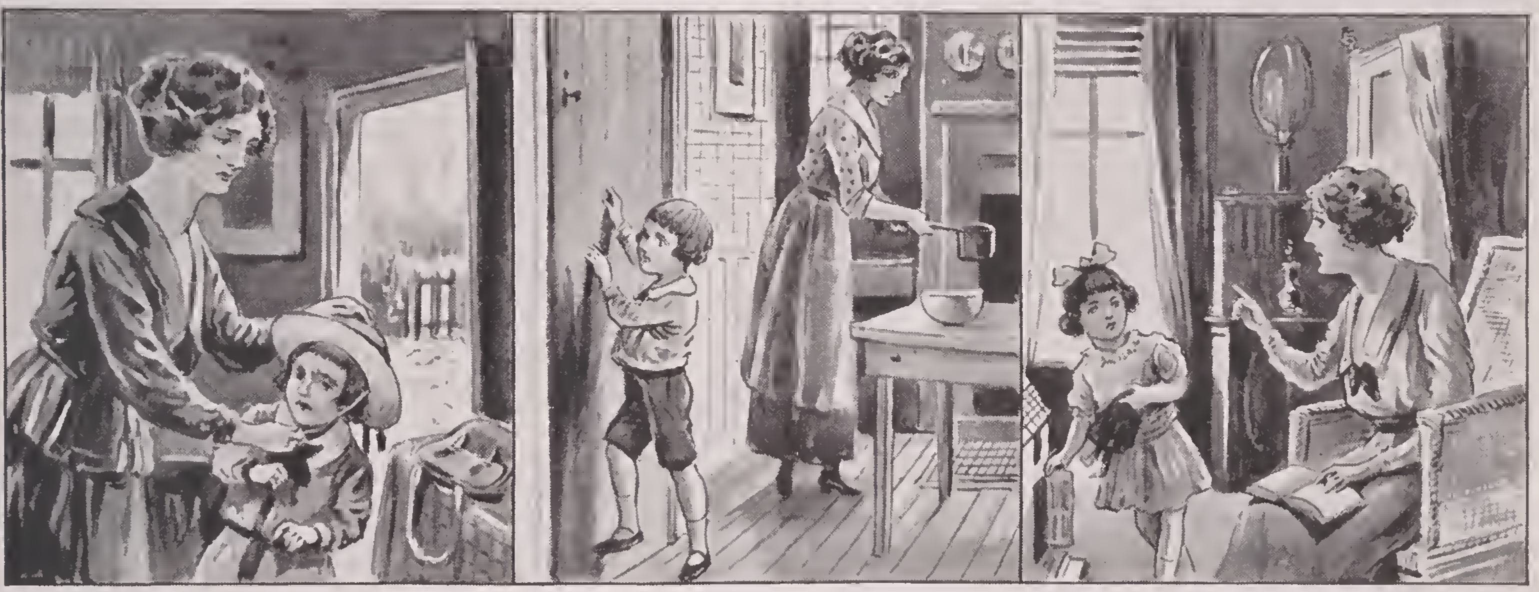
Now the dean was interested and curious. He put himself where he could hear Ellen and her mother. In a few minutes Ellen came to him, the tears still on her face, but smiling in triumph, and said, "Did you hear me?" He had; and he has often wondered since into what kind of a woman Ellen grew.

To say "no" to a child when it asks politely and then to say "yes" when it makes a horrid fuss is the quickest way to teach a child that there are ways of controlling one's parents. Beware of teaching such lessons. They always lead to the establishment of infant rule in the home and development of boys and

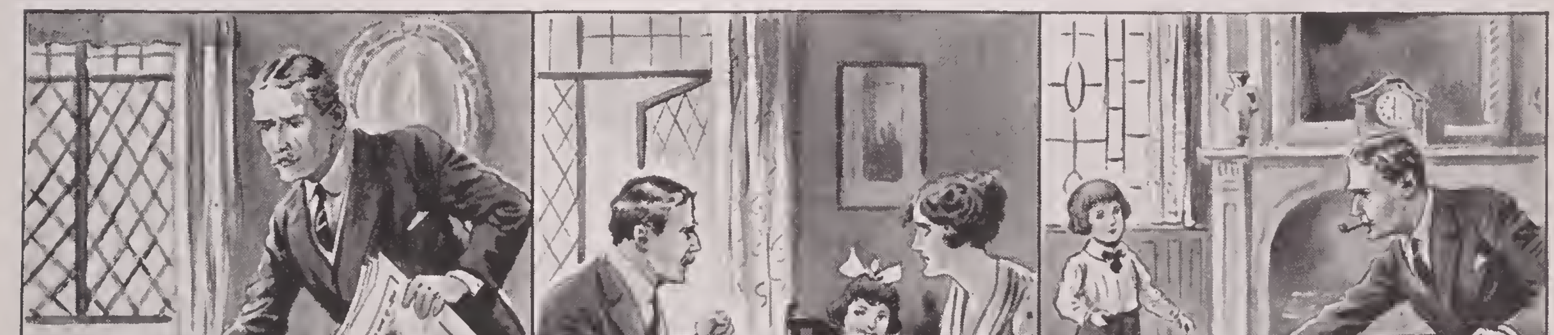
NINE MISTAKES PARENTS SHOULD AVOID



Sometimes when a little girl wants to sew, as she sees her mother doing, the mother tells her "not to bother." Also many fathers tell their boys "not to ask questions," thus losing valuable opportunities for education. But worse still is the habit of making idle threats. The mother in the picture has threatened to drop her baby if the boy is not good. Of course if the boy still acts badly, she doesn't drop the baby. So the boy soon pays no attention to her threats, for he knows she will not carry them out.



Unruly temper is one of the bad traits a child develops most easily. Only a few mistakes by the parent are enough to confirm the trait. The mother who gives in when the girl cries to be taken along, or when the boy kicks at the door to get out, soon has the child ruling her. Such a child shows temper whenever crossed, and grows into a disagreeable man or woman. The mother who is always nagging at her child teaches it to be untruthful and evasive—which is equally bad.



If the father lets himself fly into rages, the boy soon learns to fear and dislike him. Parents who quarrel with each other before a child soon lose the child's respect. And the father who throws things about cannot expect his son to be tidy, for all children imitate their parents in such matters. When children grow up to be reckless, bad-tempered, and slovenly men and women, it is usually because of such mistakes made in training them—mistakes which seem trifling at the time, but which have far-reaching results.

girls who ride over everybody and everything just to have their own ways.

In this important matter it is also wrong to allow the child to feel that he and we should take turns in obeying each other. Ruth's mother noticed that the number of things that had to be done for daughter before she would drop off to sleep were on the increase. On the night that she told Ruth there must be fewer of them, this little girl threw off the sheet, then called her mother to come to replace it. After an hour of tears and struggling, Ruth pulled up the sheet. She asked her mother to come for the good-night kiss; as she gave it she said, "Mother, why didn't you let me have my own way? It's so much nicer when you do." The next morning she added, "Mother, last night was *your* night, but remember tonight will be *my* night." Government in the home or anywhere else is on the wrong foundation so long as it rests on the feeling and idea that it is merely a matter of taking turns in having one's own way. Either it was right for Ellen, who was less than five years old, to go to bed at a certain hour and to expect to fall asleep at that time, or it was wrong of her mother to put her there. To safeguard one's health, one's nervous system, and one's disposition, one must have sufficient sleep. Out of that fact comes the rule which Ellen needed to learn to obey; which it is hoped her mother and all the rest of the family were obeying—in accordance with their ages and the amount of work and play they each did. Because life is largely made up of situations in which there are laws of health and right conduct to be obeyed, it is almost never necessary to make our children obey just because we are physically bigger.

Notice How This Mother Did It

This is what a certain young mother evidently knew. She was on a street car one day. Her little daughter of three asked for the toy which had just been bought. The mother said, "No, dear; the toy would make too big a noise in the car and annoy the people. You may play with it when you get to Aunt Kate's. Her yard is large enough for all the noise you can make with it."

This mother did not speak in words of personal authority. Had she done so, the passengers would probably have been annoyed by the usual quarrel which begins with the parent's "No, I don't want you to"; to which the child must answer in similar words and spirit, "But I want to." Instead, this mother spoke of the rights of the passengers to a fairly quiet ride. At the same time she told the child of her right to noisemaking in a big yard. It was easy to guess that this child was accustomed to reasonableness from her mother. She accepted the refusal without any teasing or pouting. She doubtless had some idea, too, that her mother was obeying the same law. Once children begin to feel that it is law that little folks and big must obey, half the trouble in training them to obedience disappears. But not all the feelings that a child can have lead to desirable acts and ideas. There are some that the child must learn to control; some indeed that must be weakened to the point of disappearance. Anger, which usually leads to fighting with fists or words, should be controlled. Envy and malice should be starved out. Vanity may be redirected to the admiration of goodness and beauty wherever found.

Think of Your Own Childhood!

We can find out what feelings children have by watching ourselves and by recalling how we felt when we were young. We should also find out what the prevailing feelings of each of our children are. Then with patience and wisdom we must plan how the bad feelings can be weakened through having no chance to be aroused, or if aroused, how they can be controlled or re-directed. And with just as much planning we must see that the good feelings are strengthened through much exercise. The specialists in nervous diseases say that the emotions are nine-tenths of everyone's life. They say also that many of the mental disorders bordering on insanity are due to early and wrong checking or use of the feelings and the instincts with which they go. From the first, then, parents should see that these qualities are cultivated: cheerfulness, though one is disappointed; bravery, though one is hurt; justice, though one has been treated unfairly. There should be fostered admirations instead of jealousies; kindnesses instead of discourtesies; loves instead of hatreds. It is through the development of the better and the best emotions that a sane and well-balanced disposition can be grown.

Just as it is right and possible to guide children to do many worth-while acts, to have many fine feelings, so it is right and possible to teach them much interesting knowledge. Too often parents speak and act as though this could and should be put off until the child is at least six or seven years old and ready to go to school.

Schooling before School Begins

One wonders whether they have never heard that because the child must be mentally active he learns more during the first six years of his life than he ever will learn in any later six years. And in most cases he could learn more than he does, and learn it more easily than later, but for the parents' misunderstanding. How often such parents tell the child not to touch—that is to examine with fingers as well as eyes—some new thing which he has never seen before, and so wants to know about. How often such parents ignore or forbid the child's questions. Sometimes they give silly, untrue, or incomplete answers. Every time a parent does one of these things to a sensible question, he is stupidly shutting a door through which the child's mind was moving in an effort to know the wonderful and complex world which must be his home. Many children so treated become the uninteresting children that we know. A few children, because of stronger inquiring tendencies, turn to other people or books or things for satisfactory answers. Almost none of them come to have a friendly give-and-take partnership with parents in the enjoyment of what they later learn at school and from newspapers, travel, and books. Parents who wish to have companionable grown sons and daughters must be companionable with them on their first excursions for knowledge, as well as during their adolescent years.

Imagination and Truth-Telling

Besides being curious, hungry for facts, the child's mind can be imaginative. Out of facts it has gathered about the world its owner can and must build little worlds of his own. These are often quite unlike the world in which the child's body lives. He is often a very wonderful person in this fanciful world. Sometimes the child's expressed imaginings will seem like lies to parents. A little thought will show that the child may be merely mistaken because his knowledge of the world is still incomplete and inaccurate. Or he may picture a plan as carried out just because it is made.

Philip Edward, a boy of six, bubbled over at dinner with the story of the surprise that was in store for his teacher. "The boys had put a kitten in her desk; it would jump out at her when she opened her desk that afternoon." Now it just happened that the teacher came to tea at Philip Edward's house that very evening. Imagine the feelings of his parents when Miss Anna Marie, in answer to the question, "Did the kitten surprise you?" said she had seen none. Then Philip Edward spoke up. "Oh, but that is what the boys are going to do when they find a kitten, and now the plan is spoiled." *After* the company was gone, father and son had a friendly helpful talk about the difference between a plan made and a plan carried out.

How Children are Made Truthful

If parents will remember two principles there will be little danger that imaginative activity will lead to lying. The first is that what the child says is a lie only when he is deliberately trying to deceive someone. The second is that a lie is the tool which an undeveloped mind uses when it can find nothing better to help its owner out of a difficulty. The child can be trained to understand when the exact truth as it is known must be told, and when imaginative tales and jokes are permissible. He can be treated sympathetically in times of accidents or disobedience, so that his mind seizes the truthful way out of his difficulties. When he is older, he builds up from his reading and from conversation pictures of places that are far away; of persons that lived long ago; of events in the future in which he will play an important part; all because his imagination was not thwarted. No parent who wishes for his child a joyous and successful life can afford to stifle this making over of the world either in the make-believe of childhood or the dreams of adolescent boyhood and girlhood.

On the other hand, every parent must be watchful of the kind of facts that are being gathered and the kind of feelings that are being tied up with them. Parents who control by wholesome play and work, study and travel, music and art, companions, and movies, what goes into the makings of a child's imaginary worlds—these parents will control to a very great extent the parts that their children will play in the real world of men and women.

The "SHOESTRING REPUBLIC" *of* SOUTH AMERICA

Extent.—North to south, nearly 2,700 miles; east to west, from 46 to 228 miles. Area, about 290,000 square miles. Population, about 4,000,000.

Natural Features.—Andes Mountains forming eastern boundary (greatest height, Aconcagua, nearly 23,000 feet); Coast Cordillera on west; long central valley between; rivers few and short.

Products.—Nitrates, copper, coal, manganese, borates, silver, and iodine; wheat, barley, oats, corn, beans, potatoes, grapes; meats, wool, leather and leather goods, textiles.

Chief Cities.—Santiago (capital, about 420,000); Valparaiso (215,000); Concepcion (73,000); Antofagasta (70,000).

CHILE (*chē'lā*). With the exception of Egypt no other country is so remarkably shaped as this narrow ribbon-strip of territory, which stretches along more than half the Pacific seacoast of South America. Place this "shoestring republic" upon the Pacific coast of North America and it would reach from the top of Lower California to the St. Elias region of Alaska. (*See* map with Brazil.) Every sort of climate is found somewhere in its length, from the dry rainless tropics of the northern part, through the mild temperate central regions, to the bleak rain-drenched archipelago of the extreme south, washed by the waters of the Antarctic seas. The snow-crowned peaks of the Andes, which near the center of Chile reach the greatest heights in America, are everywhere visible from the coast, rising in imposing array.

Yet despite the variety of its aspects, despite its enormous length, and despite the sparseness of its population, Chile has an intensely united and patriotic people. It is unique among the nations of South America in that within the memory of living man it has had no revolutions, if we except the civil war of 1888–91; and its national spirit is strongly shown by the success which has attended its wars with other nations. This national unity is largely due to the fact that 73 per cent of its population of 4,000,000 are collected in its temperate central regions.

Chile falls into three sharply contrasted districts. In the north are brown parched deserts, rich in mineral treasures. The south consists of a narrow strip of low forest mainland, fringed by hundreds of wooded islands, and terminating in the large group of islands known as Tierra del Fuego. Here the rainfall is almost incessant during the greater part of the year and the land, which is rich in forests, fisheries, and grazing areas, is peopled only by Indians and a few solitary sheep-farmers, with here and there a trading post. Between these two inhospitable regions lies the great central portion of Chile, the heart of the nation. (For the location of fertile and desert regions, *see* maps with South America.)

THE "COMFORTS OF HOME" IN TIERRA DEL FUEGO

The climate of the islands at the southern tip of Chile is so rigorous that the life of the natives is a constant battle with starvation. Some tribes live almost entirely on fish caught in the surrounding sea. This picture of the interior of a home in that desolate region shows a woman busy at a crude loom.

This beautiful and fertile region consists chiefly of a valley, about 700 miles long and 30 miles wide, between the low Coast Cordillera and the lofty Cordillera of the Andes to the east. It is a region of perpetual spring, with one of the most delightful climates in the world. Rarely does the temperature fall below freezing or rise above 77 degrees. In the northern part irrigation is necessary; toward the south the rainfall increases. Here is the granary of Chile, where all cereals, vegetables, and fruits of the temperate zone grow to perfection. Low transverse ridges of hills connect the coast mountains with the main range, dividing the long central valley into smaller valleys, with here and there swift mountain torrents cutting their way across to the sea. Agriculture proceeds here much as in the western United States. The land is divided into great ranches or *haciendas*, stretching to the horizon in rolling plains of corn, wheat, and pasture land. Wheat is the principal crop. Other important products are barley, oats, corn, alfalfa, potatoes, tobacco, sugar-beets, honey, wine, and hemp.

Farther south lie the great undeveloped regions of Chile—more than half of its available agricultural lands. Though the climate is damp and cold, southern Chile with its shaggy forests and green pastures offers many inducements to the immigrant. The soil is extremely fertile, and produces abundant crops of products that do not need much sun. There are no venomous reptiles and no mosquitoes. The extreme south, much of it still unexplored, is well adapted for sheep-grazing, which has been begun on a small scale.

Chile's Greatest Wealth in Her Deserts

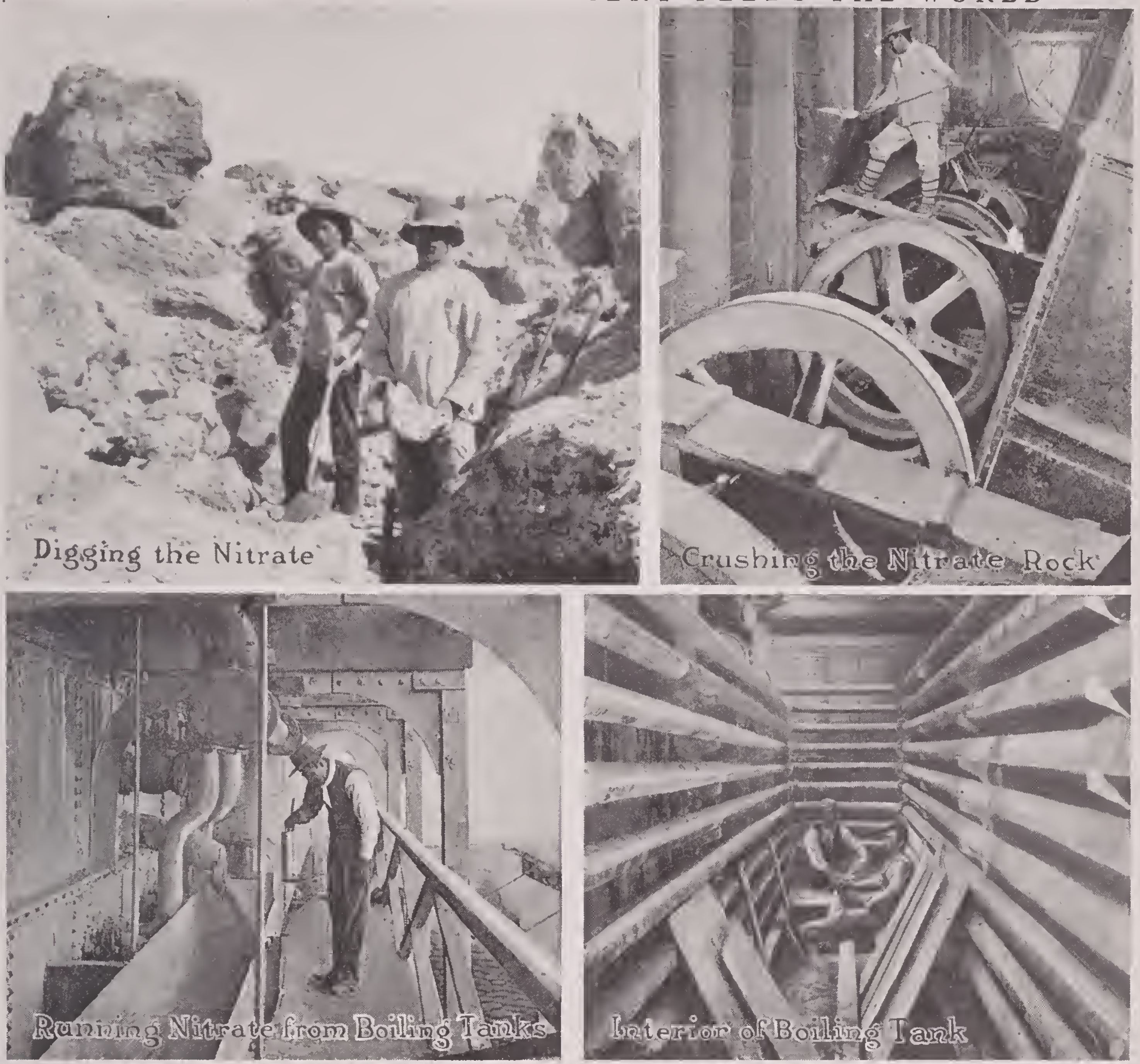
Most of the wealth of Chile, however, has come from the arid deserts of the north, where rain falls only once in many years, and where it is not wanted. Here are the great nitrate beds, which owe their existence to the absence of rain. Sterile itself, this region fertilizes the lands of the two hemispheres, for the nitrate obtained by scraping the surface for a depth of a few feet is exported as fertilizer to Asia, Europe, and the United States. The beds were probably formed by the action of marine organisms in a far distant past when this region lay submerged beneath the sea. The value of the nitrate trade is greater than all the other industries of Chile combined, and the export tax yields 70 per cent of the government's revenues. The end of this vast source of wealth is in sight however, for scientists calculate that the beds will be exhausted in less than another century.

Chile is also rich in metals. Once it was the world's greatest copper producer and it still stands high in the list. Iron, coal, lead, silver, manganese, sulphur, gypsum, and various other minerals are found in profusion, most of them still awaiting exploitation. The greatest borax "lake" in the world occurs high in the Andes of Chile, and has been a fruitful source of wealth.

A "DOUBLE-DECKER" IN SANTIAGO DE CHILE

The street-cars in Chile's capital city are built like this, as is also the case in many cities of Europe. On the upper deck the benches run down the center and the passengers sit back to back.

HOW CHILE'S HUNGRY DESERT FEEDS THE WORLD



Next to the land and the seed, the chief need of most farmers is fertilizer—and Chile's desert supplies this need for a great portion of the world. The importance of the nitrate business may be judged from the elaborate machinery used to prepare the nitrate salt for market. The nitrate is separated from the rock and dirt in which it is found by dissolving it in water. The water is then evaporated, and the pure salt is left in the evaporating pans.

Two of Chile's island possessions are of exceptional interest. Four hundred miles west of Valparaiso lies Juan Fernandez Island, where Alexander Selkirk lived in solitude for four years, inspiring Defoe's great romance, 'Robinson Crusoe' (*see* Crusoe, Robinson). Two thousand miles from the coast is Easter Island, where a great row of colossal stone images presents one of the unsolved enigmas of the world. Of the mysterious race who carved and set up these mighty idols on this remote bit of land nothing is known.

The progressiveness of the Chilean people is shown in the development of their railways, the extent of which exceeds that of any other of the republics of the Andes. More than 5,600 miles have been constructed, including a road running nearly 3,000 miles of the length of the country. The famous Trans-Andean road is, in point of difficulty, perhaps the most astounding achievement of the railroad engineer. Climbing hills so steep that part of the way it travels by a cog-wheel apparatus, this road links Valparaiso, Chile's greatest seaport, with Buenos Aires, capital of Argentina, and reduces the 11-day journey by boat through the Straits of Magellan to 40 hours overland.

"The Yankees of South America"

The Chileans are sometimes called "the Yankees of South America," and they are indeed the most enterprising and energetic of the peoples on the Pacific side of South America. Their long coastline, open to enemy attacks, has forced them to build a powerful navy, and their army is one of the most efficient in South America. Chile ranks with Brazil and Argentina—the so-called "A.B.C." powers—as one of the three leading powers of the continent.

From 30 to 40 per cent of the population is said to be of pure European descent, a larger proportion than in any other South American state except Argentina. Nearly 60 per cent is made up of the so-called *mestizos*, of mixed Indian and European parentage. The fusion of the races has proceeded further here than in Peru and Bolivia, and the half-breeds are a hardy, vigorous, and independent class. More than half of the population is engaged in agriculture. The system of land tenure, whereby the lands are held by a few great landowners who live in princely fashion on their great estates, while the labor is performed by badly treated and ill-paid tenants or *peons*, has kept the workers ignorant, poor, and without a voice in the government. Only about 60 per cent of the population can read and write. There are government-controlled schools in all the towns, and education is free but not compulsory. Chile also has a state university and a number of trade schools and teachers' colleges.

A SCENE IN CHILE'S CAPITAL

Like most large South American cities, Santiago is filled with handsome buildings and beautiful statues. While the older quarters remind us sometimes of old Spanish colonial days, the newer quarters have a busy modern aspect.

Civilization has as yet scarcely touched the Araucanian Indians, who live on the slopes of the central Andes. The Araucanians can be said to be the one aboriginal people of the Western Hemisphere that were never conquered by the European invader. For centuries they successfully resisted the power of the Spanish invaders and their descendants, and it was not until 1881 that their nation, greatly reduced in numbers, recognized the authority of Chile.

The Spanish Conquest of Chile

The Spanish conquest of what is now Chile was begun in 1535 by one of the lieutenants of Pizarro (*see* Pizarro, Francisco). Five years later the city of Santiago, which has ever remained the capital, was founded. Chile rose against Spanish rule in 1810, finally winning independence in 1818. General Don Bernardo O'Higgins, an Irishman who had distinguished himself in the war, was chosen dictator, but was deposed by the aristocratic party because of his attempts to establish a representative constitutional government. From 1865 to 1869 Chile was at war with Spain as an ally of Peru, and Valparaiso suffered severely from the guns of the Spanish fleet.

Boundary disputes with Bolivia again led to war in 1879. Peru came to the aid of Bolivia; but Chile was overwhelmingly victorious and stripped Bolivia of her only strip of seaboard, and also deprived Peru of the rich nitrate district of Tarapacá and the province of Tacna-Arica. Disputes over these territories disturb the diplomatic peace of South America to the present day.

A few years later civil war broke out in the term of President Balmaceda, who advocated a more democratic government, education of the people, and separation of church and state. Balmaceda's forces were defeated and he committed suicide. During the war Chilean feeling was aroused against the United States, through the belief that this government favored the cause of Balmaceda. United States sailors were attacked in the streets and several were seriously or mortally wounded. The dispatch of two American warships to Chile brought a speedy apology and compensation. Chile was one of the few sovereign states during the World War of 1914–18 which failed either to break off diplomatic relations with Germany or to declare war.

Though Chile has a republican constitution, literacy and property tests disfranchise more than half the men of voting age, and the political power is almost entirely in the hands of the rich landowners. In form the government is a centralized, not a federated, republic. The country is divided into 23 provinces, administered by governors appointed by the president. The smaller political subdivisions are administered also by appointed officials. The only officials of the local government elected by the people are the municipal boards. The president is elected for five years by "electors" chosen by the people. There is a congress of two houses. Trial by jury exists only for suits involving the question of abuse of the freedom of the press. The Roman Catholic church is the state church and is supported at public expense. (*See* Santiago; Valparaiso.)

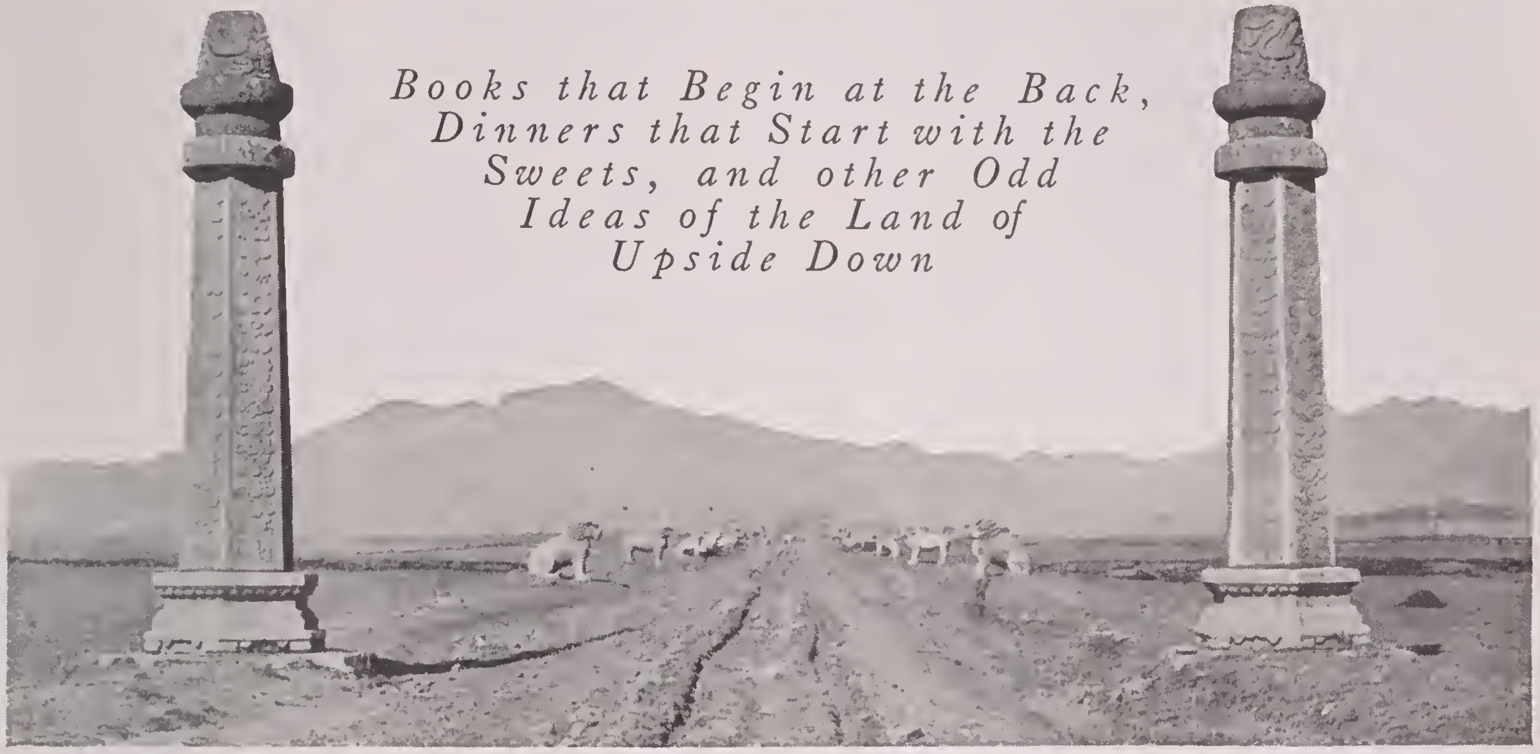
CHIMPAN'ZEE. The most intelligent of the anthropoid or manlike apes, the chimpanzee is also very docile, and individuals are often shown in the theaters so highly trained that they wear clothes, sleep in beds, and eat with a knife and fork. It is affectionate when treated kindly, and becomes exceedingly jealous of any rivals for its master's affections. In confinement it is highly susceptible to disease and rarely survives long; in its native haunts its average life is from 20 to 24 years. R. L. Garner, who spent four months in a cage in an African jungle studying this remarkable animal, says that it has a vocabulary made up of from 12 to 20 distinct sounds.

The chimpanzee is smaller than the gorilla, which it closely resembles. An average specimen is about 5½ feet tall, with a spread of arms and hands of nearly 6 feet. The head is rounded and short, with large and prominent ears. It has no tail and is covered with short black or brownish-black hair.

These animals are dwellers in the tropical forests of Africa from the Atlantic to the Nile and spend most of their time in trees, in which they build beds of twigs and leaves. They live in families of four or more individuals and treat their young with great tenderness until six or eight years old. When walking on the ground the chimpanzee steadies itself with its hands, resting part of the weight on the bent knuckles. When brought to bay, it is a terrible fighter. Fruit, nuts, and insects form its favorite diet. Scientific name, *Anthropopithecus niger*.

Ancient CHINA, VAST *and* STRANGE

Books that Begin at the Back, Dinners that Start with the Sweets, and other Odd Ideas of the Land of Upside Down



When they pass along this road near Peking, the Chinese tread reverently, for to them it is sacred ground. Here the ancient kings of the Ming dynasty lie buried. The stone figures of animals mark some of their graves. During the Ming period, from the 14th to the 17th century, China enjoyed great power and prosperity, and the traditions of those times are cherished today. One of the strongest feelings among the Chinese is their reverence for their dead.

Extent.—West to east, about 3,000 miles; north to south, 2,400 miles. Area, about 4,277,000 square miles—including China proper (1,533,000), Manchuria (364,000), Mongolia (1,370,000), Sinkiang (550,000), and Tibet (460,000). Population, about 362,000,000 (China proper, 336,000,000).

Physical Features.—Mountains: Himalayas (on southern boundary of Tibet, 20,000 to 29,000 feet); Kuenlun (15,000 to 20,000 feet); Tien-Shan (18,000 to 23,000 feet); Altai (5,000 to 10,000 feet); Great Khinghan (6,000 to 7,000 feet). Lowest point—Luktchun depression in northwest, nearly 400 feet below sea-level. Greatest elevation—Tibet Plateau, 16,000 feet. Rivers: Yangtze-kiang ("Son of the Sea"); Hwang-ho ("Yellow River"); Si-kiang ("West River"); Pei-ho ("White River"). Deserts: Gobi (300,000 square miles); Taklamakan (260,000).

Communications.—Numerous navigable rivers and canals; more than 6,000 miles of railway open to traffic, and more than 2,000 miles under construction. Roads few and bad.

Products.—Rice, tea, cotton, sugar, indigo, wheat and other cereals, tobacco, peas and beans, silk culture, bamboo; fish and hogs; textiles (silk and cotton), porcelain, mats, lacquered ware, paper; mines of coal, iron, copper, tin, antimony; petroleum.

Chief Cities.—Canton, Hankow, Shanghai, Tientsin (more than 1,000,000); Peking, Foochow (more than 500,000); Hongkong (British colony), Chungking (more than 300,000); Nanking, Mukden, Amoy (more than 100,000).

CHINA. "If you could dig a hole deep enough to go right through the earth and come out on the opposite side, you would come out in China."

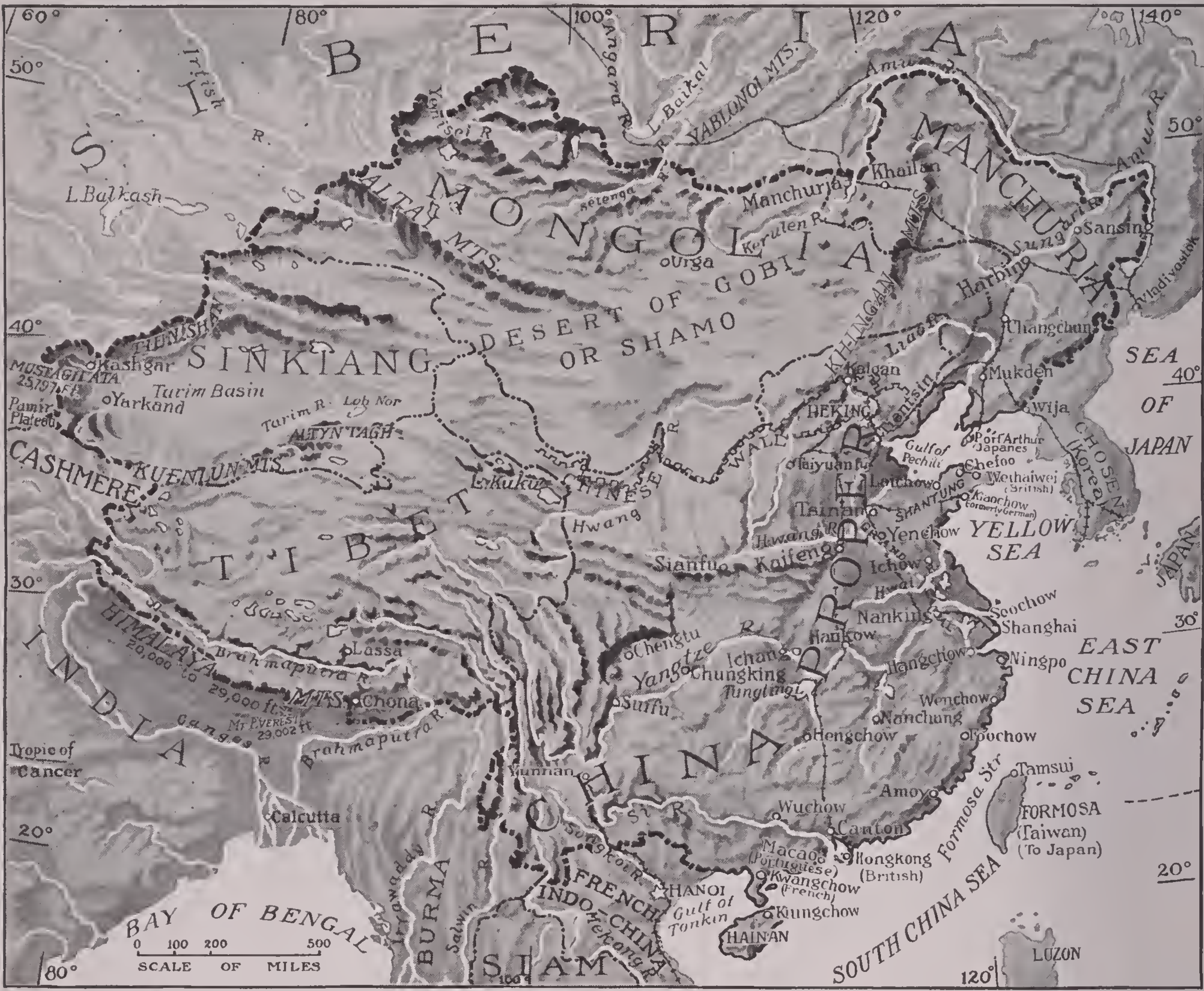
This is what they told us when we were very young, and it's true enough of the physical world. But as we grow older we find that it's true in another way. For if you could dig deep enough into the mind of man to come out on the other side, if you could think every thought in almost exactly the opposite way from the way you think now, you would probably "come out in China."

A book in China begins at the top of the last column on the last page and goes backward till it ends with the first column on the first page. A dinner begins with fruit and sweets and ends with soup and rice. Men in China wear skirts and women wear trousers. White is the color for mourning, and brides dress in scarlet. And so it goes.

You will never understand why the Chinese think the way they do, and they will never understand why you think as you do. A Chinese and an American can feel the same things; they can both be hungry or happy or ill or in love. But they will never understand each other's thoughts. This is the first thing to remember about China. We can learn certain things about China, but we can never really understand it.

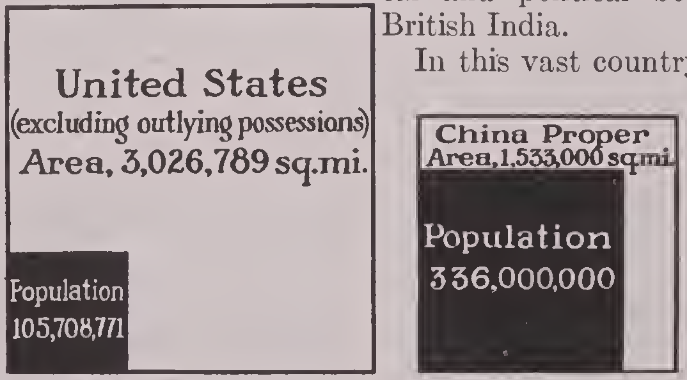
The country itself we can understand of course. It is a vast country on the east coast of Asia, and it it physically not unlike the United States. In the

THE COUNTRY THAT HOLDS ONE-FIFTH OF THE HUMAN RACE



This map of Greater China tells you why it is that 336 millions of her population are crowded down into the southeastern pocket of China proper, while only 26 millions occupy the vast stretches of Mongolia, Manchuria, Sinkiang, and Tibet. For the latter are mostly high and waterless wastes, while the territory to the east of those central mountains is exceedingly fertile and crossed by many streams great and small.

north the winters are very cold and the summers very hot. The differences are not so marked in the south, where the climate is tropical. A great river, the Yangtze, almost as great as the Mississippi, runs through it, and its fertile basin forms the whole of central China. Western China consists of sparsely populated highlands, and eastern China of lowlands densely populated. Nearly the whole country is surrounded by mountains.

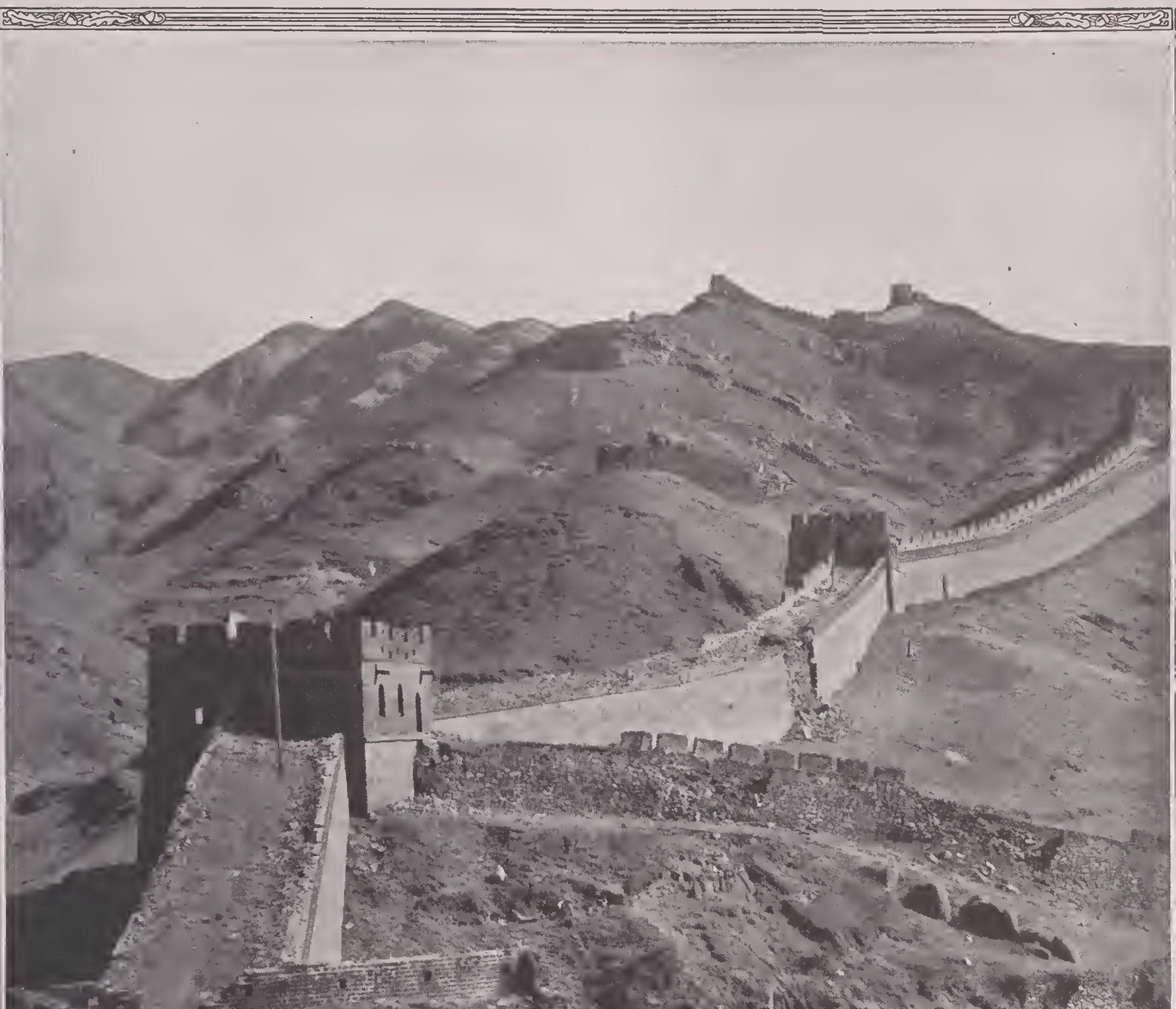


With an area of little more than half that of the United States, China proper has more than three times as many people.

China as a whole includes China proper, with its teeming human life and historical importance; Manchuria, which is largely under Japanese control since the Russo-Japanese War of 1904–05; Mongolia and Chinese Turkestan (Sinkiang) in the northwest, with their vast sandy deserts of Gobi and Taklamakan; and the mighty plateau and mountain mass of Tibet, a geographical and political borderland between China and British India.

In this vast country, a third again as large as the United States—huddled together like ants in an ant hill, live more than one-fifth of the human beings in the world—about 362,000,000 people. It has been estimated that for every square mile of the earth's surface there are about 30 people. But in China proper, even in the highlands, every square mile has more than 100 people; in the lowlands every mile has 300 to 400, while Shantung has over 500. This means crowded poverty.

THE MIGHTY WALL OF SHI-HWANG-TI



In the 3d century before Christ, when the Tatars threatened to conquer China, the Emperor Shi-Hwang-ti started building a great wall along the northern boundary to keep them out. It was repaired and extended in the 15th and 16th centuries A.D., and most of it still stands today, a monument to Chinese industry and engineering skill. If you were to follow all its windings, across valleys and over mountains that rise as high as 4,000 feet above sea level, you would travel about as far as half-way across the United States.

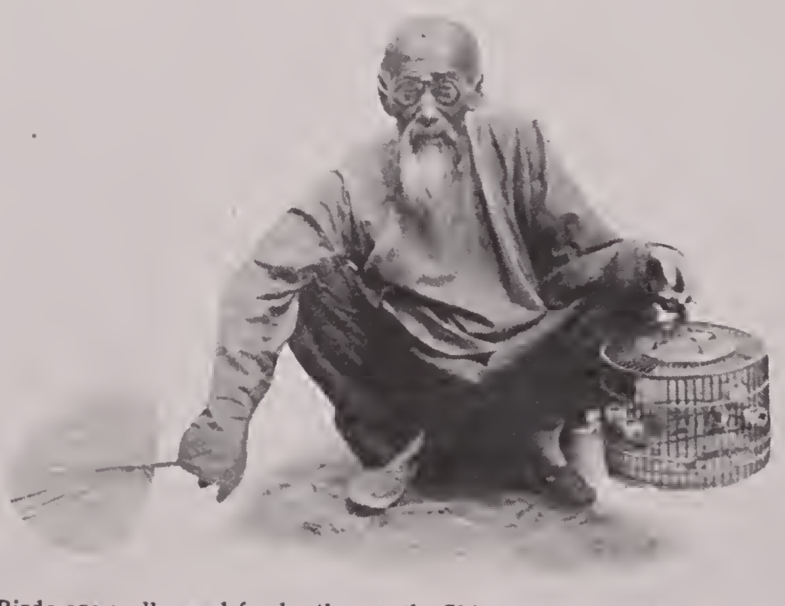
Fuel is very scarce, since nearly all the trees in China were cut down centuries ago and the vast coal deposits are almost unworked. As a result the houses are not heated in winter and the people must wear many coats one on top of another. Thus Chinese will speak of a "three-coat cold day." The poor people dress in cotton, usually blue, and the upper classes in silk. The people belong to the Mongolian race. Their skins are of a bronze or yellow color — sometimes almost white, sometimes yellow, and sometimes, especially in the south, almost brown. Their hair is jet black, stiff, and always straight. The men have very little hair on their bodies and can seldom raise a beard, though when they can it is considered very honorable. It is also fashionable to let the fingernails grow very long. Sometimes they protect these nails with a sort of case not unlike a pencil case.

HE REFUSES TO WORRY!

This is a typical Chinese merchant. He smokes a long pipe with a very small bowl containing only a thimbleful of tobacco at a time. He doesn't mind refilling it often as he has plenty of leisure.

For centuries the upper-class Chinese bound the feet of their little girls so tightly, from the time they were five or six years old, that their feet ceased to grow and the toes curled under and the bones were distorted. As a result, many upper-class women walk on mere stumps of feet and are practically helpless. Some of them cannot walk at all. This custom seemed barbarous to Europeans and the more modern Chinese, and an "Anti-Foot-Binding League" was formed which has made progress since 1900 in stopping the practice. In the "treaty ports," especially, it is not unusual to see girls with feet like ours, but in the interior, by far the greater part of the country, feet are still bound as a matter of course.

TAKING HIS PETS FOR A WALK



Birds are well cared for by the gentle Chinese. This man has just squatted down to rest while taking his pets out for a walk. Birds will not sing, the Chinese believe, unless they are given these airings.

Since the overthrow of the Manchu dynasty, many men have cut off their queues or pigtails, which were originally worn as a sign of submission to those rulers. But the great majority throughout the country, especially the coolies or laborers, still wear them, so great is the power of custom in China.

Most Americans think that because there is a law in China against both foot-binding and the wearing of queues, these things have disappeared. But a law in China means as a rule only that the rulers *hope* the people will do as they are asked. It does not mean, as it does here, that the thing forbidden is stopped.

A CHINESE SCRIBE

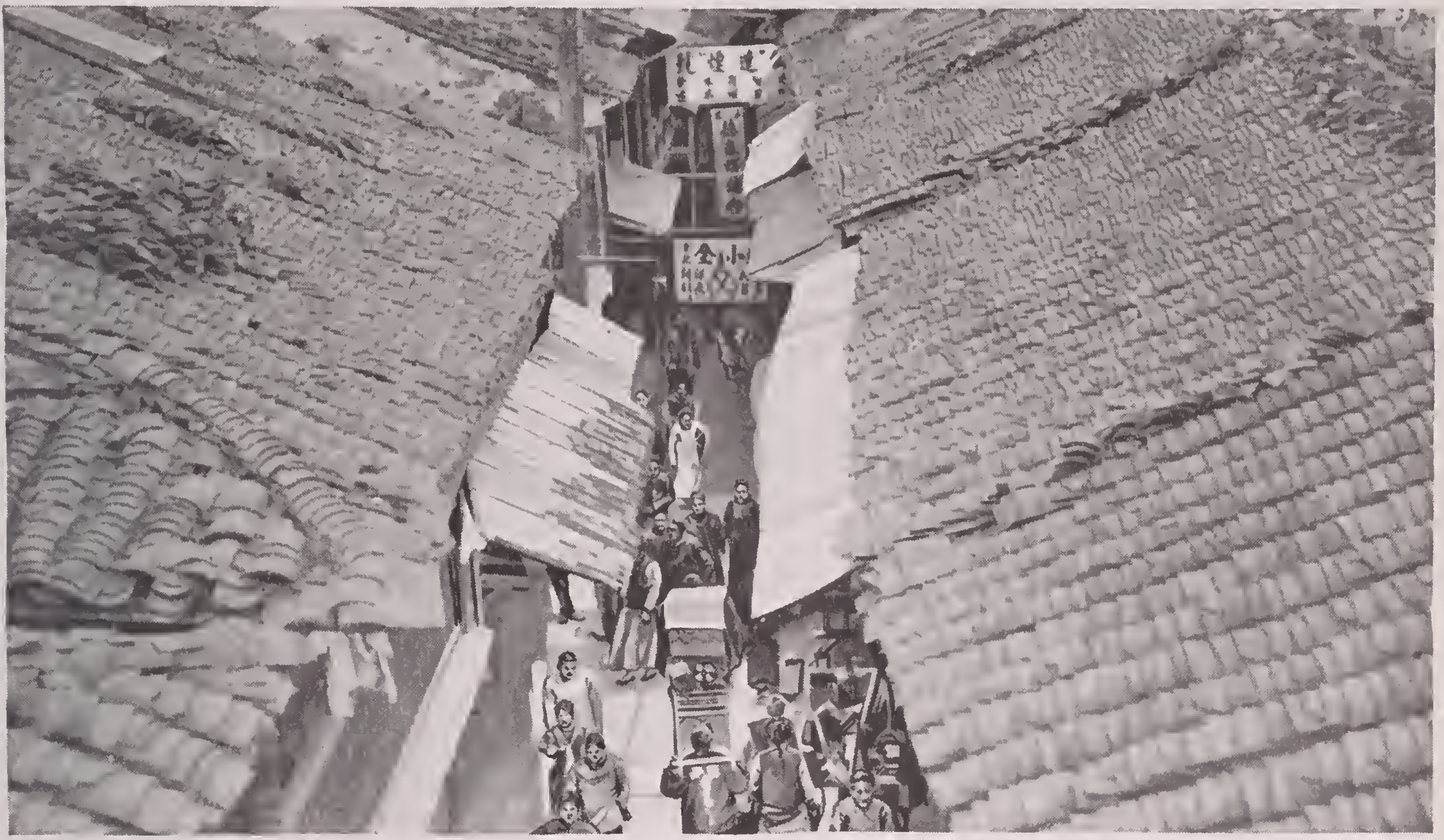
This is a professional letter-writer. Few Chinese peasants are able to write, so these men find constant employment.

China is a terribly dirty country, especially southern and middle China. You have never in your life seen anything so dirty as the Chinese streets. They are dirtier and narrower than the dirtiest alley in America. This dirt breeds disease, so that China has hideous plagues. The insides of the houses are not so dirty, of course. But even these are far from clean as a rule, except among the wealthy people, who are very, very few.

With these bad traits there are many excellent ones. The Chinese toil hard for the support of their families, and hold the aged in great respect. Politeness is carried to an extreme. The upper classes never contradict, and are careful to avoid offensive statements. In giving an invitation they speak with contempt of their "unworthy" selves, families, and houses, and humbly ask the honor of the visitor's presence. Whether or not he can read and write, the poorest laborer knows the laws of etiquette, and is as much at ease among his intellectual superiors as with his equals.

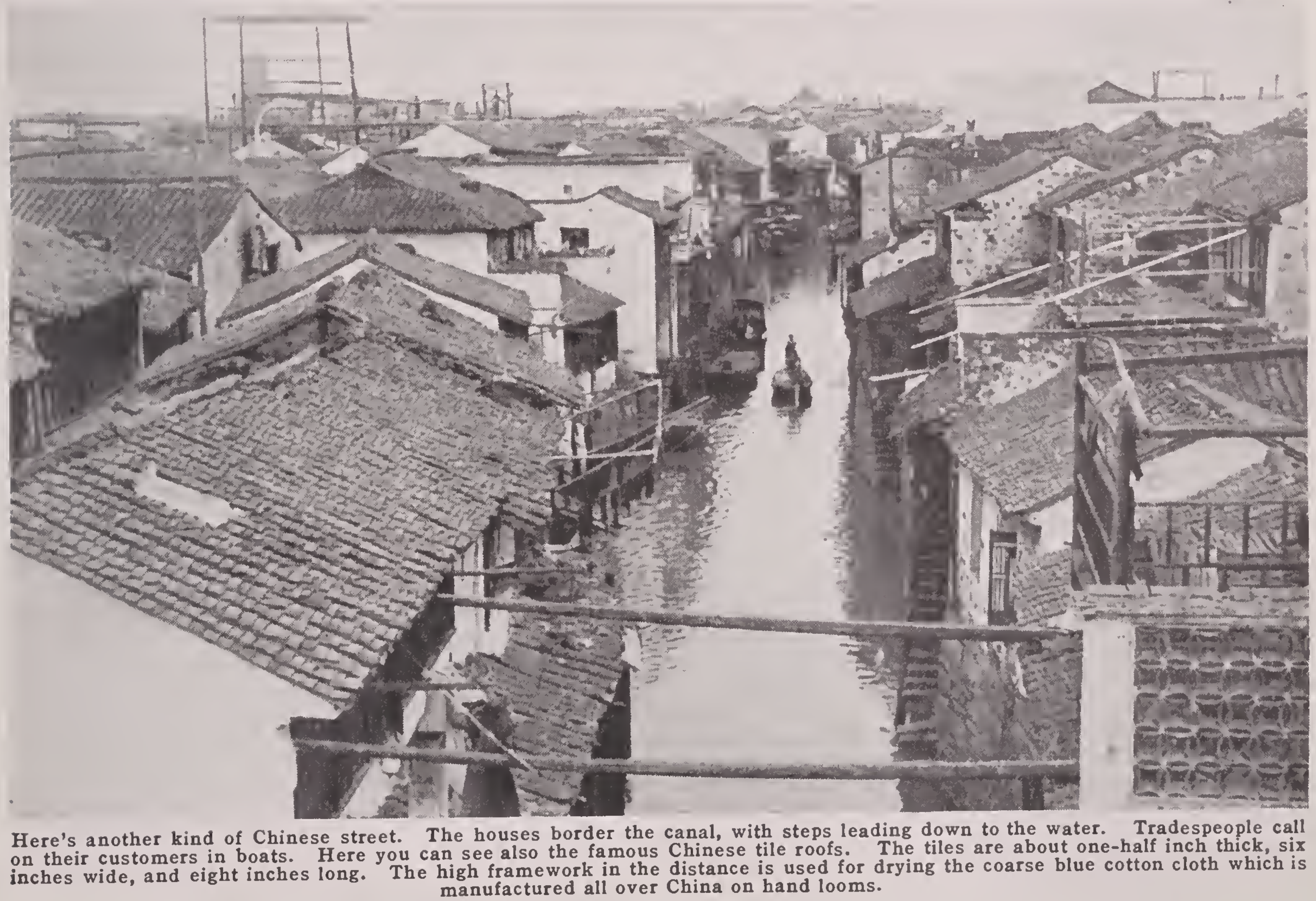
The Chinese have many beautiful festivals, such as the "Festival of the Dragon Boats," the "Feast of Lanterns," and other gaieties. They are fond of flying kites and even the grown people fly kites shaped like great dragons and lions and other fantastic things. The

IN CHINA THEY CALL THIS A "STREET"!



There isn't much room left for streets in crowded China. This one is narrower than sidewalks usually are in our business districts. The awnings of the little shops almost meet overhead. Signs are hung out during the day to advertise the merchants' wares, but they are all taken in at night to keep them from being stolen for firewood.

ROOFS, BACK STEPS AND WATER ALLEYS



Here's another kind of Chinese street. The houses border the canal, with steps leading down to the water. Tradespeople call on their customers in boats. Here you can see also the famous Chinese tile roofs. The tiles are about one-half inch thick, six inches wide, and eight inches long. The high framework in the distance is used for drying the coarse blue cotton cloth which is manufactured all over China on hand looms.

whole country is very picturesque, with many beautiful temples, tall pagodas, gorgeous red and gold signs, and other beautiful things.

The principal food of the Chinese is rice. They also eat pork, poultry, and vegetables. China is the one country in the world where milk is not used for food. Bird's-nest soup, shark's fins, lotus pods, and other curious things are considered great delicacies. Many of the dishes are wonderfully cooked. The universal drink at all times is tea, partly because in this over-crowded land the water is badly polluted.

There are 18 or more spoken languages or dialects in China. But—and this seems strange to us—there is only one written language. Although a man from Canton cannot talk with a man from Peking, yet if they are both educated they can write to each other. The reason for this is that the Chinese written characters do not represent sounds, as our words do. They are more like pictures, each picture meaning the same thing to any Chinese, just as an American and a Frenchman can both understand a picture of a cow. These characters are called *ideographs*, because they represent ideas and not names. There are over 44,000 of these characters, but in ordinary reading one needs to know only about 3,000. Think how much better off you are, with an alphabet of only 26 characters! The Chinese written language is very old and very rich, and much beautiful literature and many beautiful poems were written in it in the old days of China's greatness.

The Chinese as Artists

It is a curious fact that early Chinese painting grew out of the fine art of writing. The elaborate forms of the Chinese characters, applied with a fine brush, and placed on the page with a fine sense of rhythm and balance, early developed skill in the use of the brush. Thus Chinese painting, in spite of its beautiful use of color, is essentially an art of the line. The figures are outlined with delicate sure strokes, and filled in with water-colors, which explains that curious lack of perspective in Chinese painting.

In other forms of art too—architecture, sculpture, pottery, embroidery—the Chinese have produced many exquisite things. The architecture of China's Golden Age, with its graceful pagodas, its temples with curving roofs, and its carved stonework, is as beautiful as any in the world. Nothing more beautiful has ever been made than Chinese porcelains, bronzes, and delicate jade and ivory carvings of that period, and their influence on Western art is very strong today.

China has many religions, though no one of them is very active. Originally the Chinese had a simple religion, a "worship of heaven," with only one god. Later Taoism was founded by Laotse and it is still practiced. About 500 years before Christ, Confucius laid down a system of morals called Confucianism. About the time of Christ, Buddhism was brought over from India. Mohammedanism has some followers, and very recently Christianity has made much progress. All these religions, except Christianity, are now practically mixed together, so that the general populace can hardly tell one from the other.

Feeding 360,000,000 Mouths

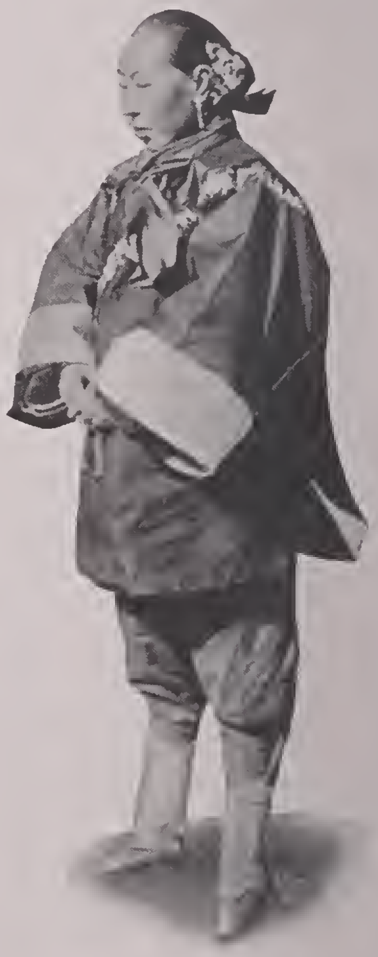
China is primarily an agricultural country. Much of its soil is immensely fertile and it is worked with minute care. Even the mountain slopes are terraced and tilled, sometimes to the height of 8,000 feet. Rafts covered with earth support flourishing gardens even on the rivers' surface. But the practice of "ancestor worship" withholds from cultivation many plots where lie the coffins of the Chinese dead. Elaborate fertilization is practiced, as well as irrigation, but the farmers follow slavishly the routine of their forefathers, and western methods and agricultural machinery are little used. Generally the tools and implements are of the rudest description. This is due in part to the very great veneration which the Chinese have for their past.

Rice, the chief food of the country, is the principal crop. Bamboo is grown as building material and the tender shoots are eaten as we eat asparagus. Tea and silk are the most important exports. Other products are cotton, wheat, barley, millet, maize, sugar, tobacco, poppies for opium, and fruit.

China has great mineral wealth, very largely undeveloped, including iron, coal, copper, tin, etc. Its coal fields are reckoned as among the most extensive in the world. The richest deposits, however, are situated in the interior and are inaccessible with the present defective means of communication. The principal manufactures are silks, porcelain, lacquered ware, etc., in all of which the artistic skill of the Chinese has been renowned for centuries.

The most famous single structure in China is the Great Wall. This is a brick and masonry wall about 1,500 miles long, built across northern China, over mountains and through very difficult country. It is one of the greatest of all engineering feats and one of the "seven wonders of the world." It is in most places from 20 to 30 feet high, from 15 to 25 feet thick, and has square forts

LADY "LILY-FOOT"



Thanks to foreign influence, not nearly so many Chinese women as formerly now suffer from the practice of foot-binding, which produced such tiny "lily-feet" as you see here.

CHINESE THAT "GO BOATING" FOR LIFE!

No other country in the world has so many boats as China. Each of these sampans, or house-boats, though only about 15 to 20 feet in length, is the home of an entire family. Here sometimes as many as a dozen people—grandfather and grandmother, uncle and aunt, mother and father, and several children—cook, eat, and sleep. We should not like such cramped quarters, but these people must content themselves with little. They pay no rent, do very little work, and can change their neighbors and scenery whenever they please.

every half-mile or so. It was begun in the 3d century before Christ, by the Emperor Shi-Hwang-ti, to keep out the Tatars.

The Grand Canal, another great work begun early in the Christian era, runs north and south through middle China and is about 850 miles long. The "Altar of Heaven" at Peking, the tombs of the Ming emperors at Nankow with their carved animals, and the temple of Confucius at Chu-fu, are other famous monuments of the lost grandeur of "Cathay," as China was called in the Middle Ages.

The China of the Past

Long, long ago, many hundreds of years before Christ was born in the Holy Land—when the people of Britain were still savages who painted themselves blue, and northern Europe was inhabited only by barbarous tribes—Egypt, Babylonia, and China were the greatest nations in the world. Today China is known politically as a "second-class nation." Perhaps now that Europe has grown great with science and industry and has come to awaken China out of her sleep, China may again be a very great nation.

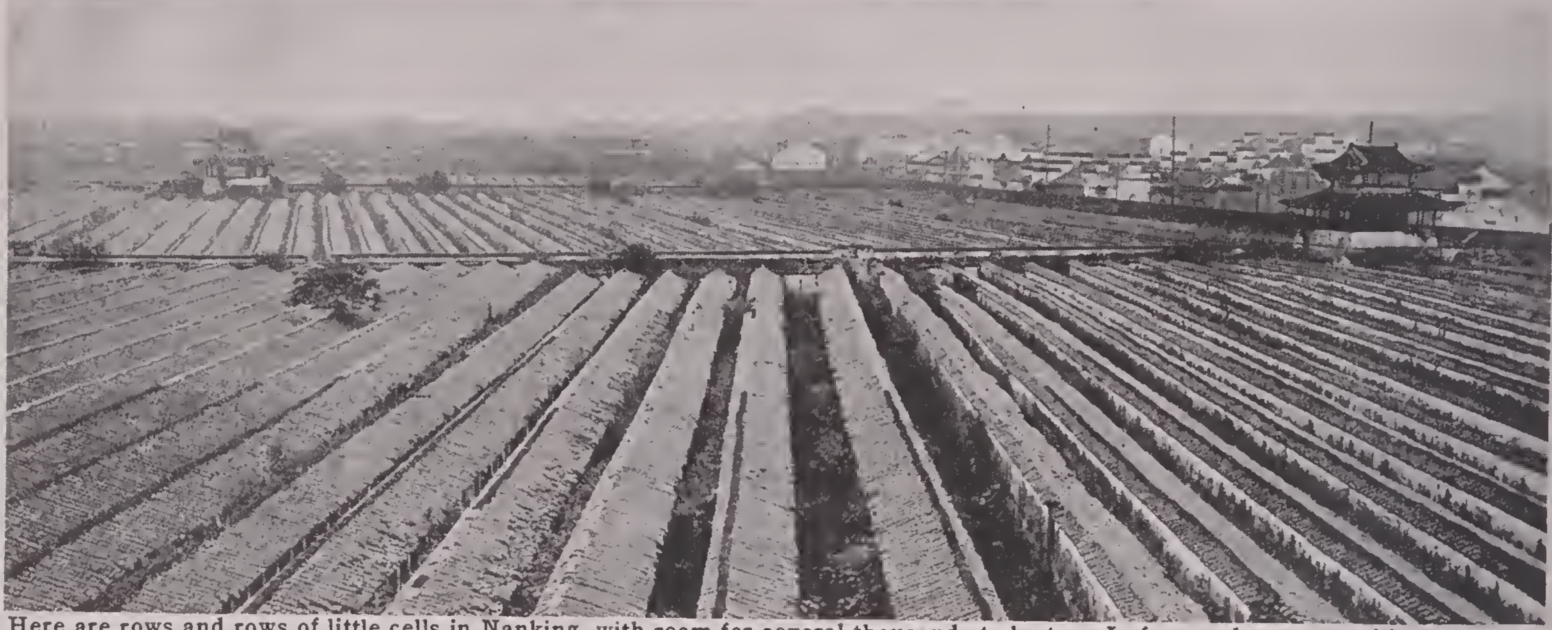
The first that Europe really knew of "Cathay" was from a Venetian traveler named Marco Polo, who visited China in the 13th century (*see* Polo, Marco). When Columbus discovered America he was really looking for China and India. But the days of China's greatness had begun long before that. The Ts'in dynasty (249–210 B.C.), the Han dynasty, the Sung dynasty, and other famous periods were over before the age of discovery, so that China was really declining in power before Europe realized her greatness.

In the 12th and 13th centuries after Christ the

THE SIMPLE LIFE IN WALLS OF MUD

Life is very simple here, also. These houses are built of mud with straw roofs. They have only one room, in which live from five to a dozen people with a couple of dogs and as many pigs as they can get their hands on.

WHERE CHINESE STUDENTS WERE EXAMINED



Here are rows and rows of little cells in Nanking, with room for several thousand students. In former days competitive examinations were held in the capital of each province for those who wanted to qualify for appointment to public office. The examination continued for three days and three nights, and each student had to remain alone in his cell to prevent any possibility of receiving information from his friends. Many collapsed during the ordeal. Fortunately for the students, this system was abandoned a few years ago.

Mongols invaded China, and first Genghis Khan and then Kublai Khan became emperors. This was another great epoch for China, even though the Mongol rule lasted for centuries. In the 17th century another foreign people, the Manchus, conquered China and ruled it till 1912. The great Empress Dowager, Tsz'e An, who died in 1908, was the last important Manchu.

In 1841 England forced China to open the "treaty ports" and the westernizing of China began. The treaty ports are not, properly speaking, Chinese cities at all, but are international European cities, with European laws and customs, imbedded in Chinese territory. The city of Shanghai, for instance, is much more important as a European than as a Chinese city. The island city of Hongkong, near the coast in the south, is a British possession, but it rivals Shanghai in Chinese trade. The greatest truly Chinese cities are Peking in the north, and Canton in the south. Aside from the international treaty ports, several outside nations, including England and Japan, hold bits of Chinese territory under treaties.

The government of China is now a republic, for in 1912, as a result of one of the most amazing revolutions in history, the Empire of the Manchus was overthrown. Enlightened Chinese, educated in Europe and the United States, with Dr. Sun Yat Sen at their head, were determined to have far-reaching reforms. Even an humble apology for the misgovernment of the realm, issued in the name of the pathetic little six-year-old emperor, could not save the throne. For a number of years, however, the path of the new Republic of China has been made difficult by civil wars between rival leaders and sections of the country, and the intrigues of foreign powers. In theory the land is governed from Peking, the capital. But in practice what little governing is done comes from local officials, still usually called mandarins. The 18 provinces are at best but loosely held together. It is said of the ordi-

APOLOGY FOR THE MISGOVERNMENT OF CHINA ISSUED IN THE NAME OF PU-YI, THE LITTLE SIX-YEAR-OLD EMPEROR (1911)

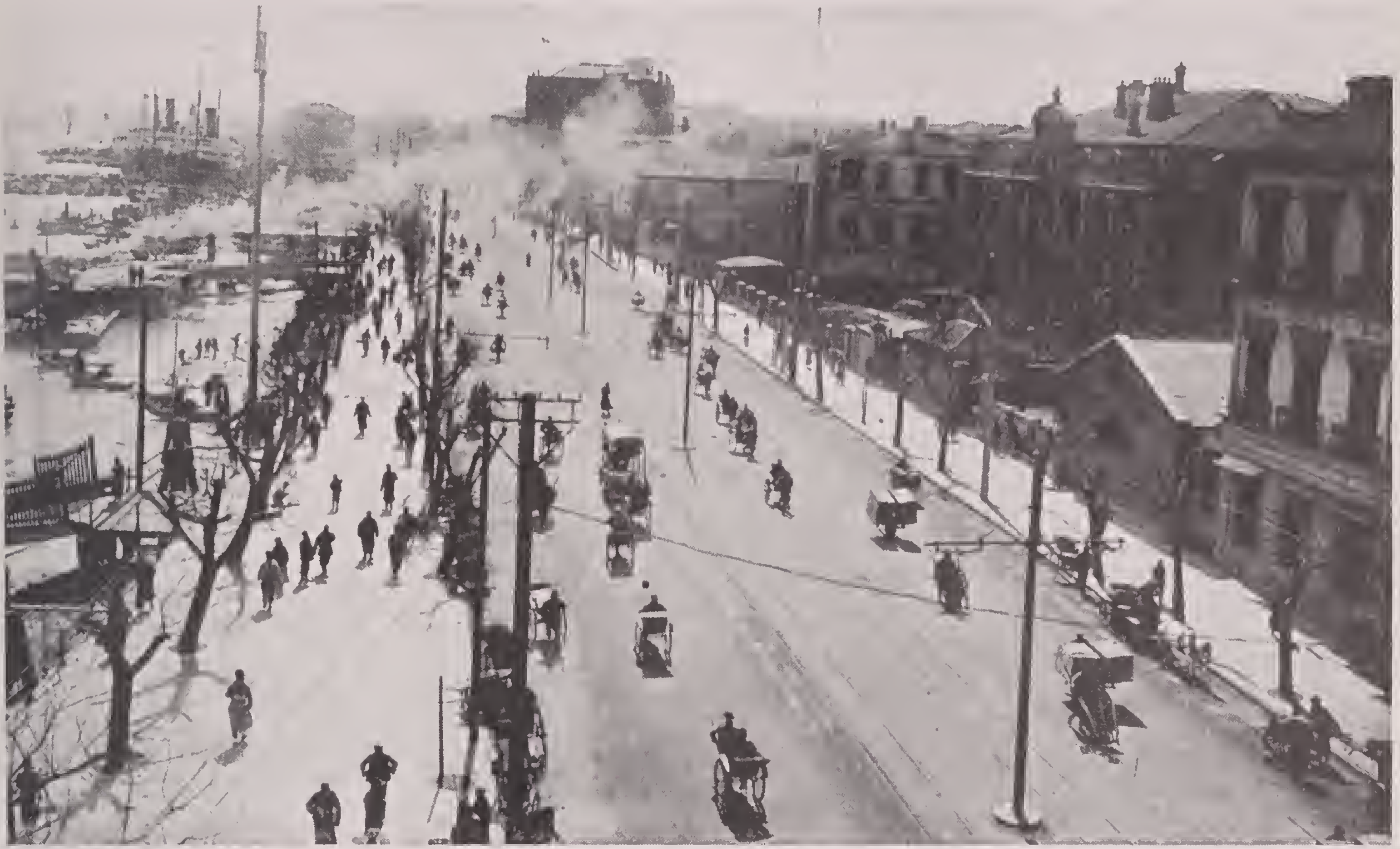
"I have reigned for three years and have always acted conscientiously in the interests of the people; but I have not employed men properly, not having political skill. On railway matters someone whom I trusted fooled me, and thus public opinion was opposed. When I urge reform the officials and gentry seize the opportunity to embezzle. When old laws are abolished high officials serve their own ends. Much of the people's money has been taken, but nothing to benefit the people has been achieved. People are grumbling, yet I do not know; disasters loom ahead, but I do not see.

"All these things are my own fault, and hereby I announce to the world that I swear to reform, and with our soldiers and people to carry out the constitution faithfully, modifying legislation, developing the interests of the people, and abolishing their hardships—all in accordance with the wishes and interests of the people. Old laws that are unsuitable will be abolished. The union of Manchus and Chinese, mentioned by the late emperor, I will carry out.

"Even if all unite, I still fear falling; but if the empire's subjects do not regard and do not honor fate, and are easily misled by outlaws, then the future of China is unthinkable. I am most anxious day and night. My only hope is that my subjects will thoroughly understand."

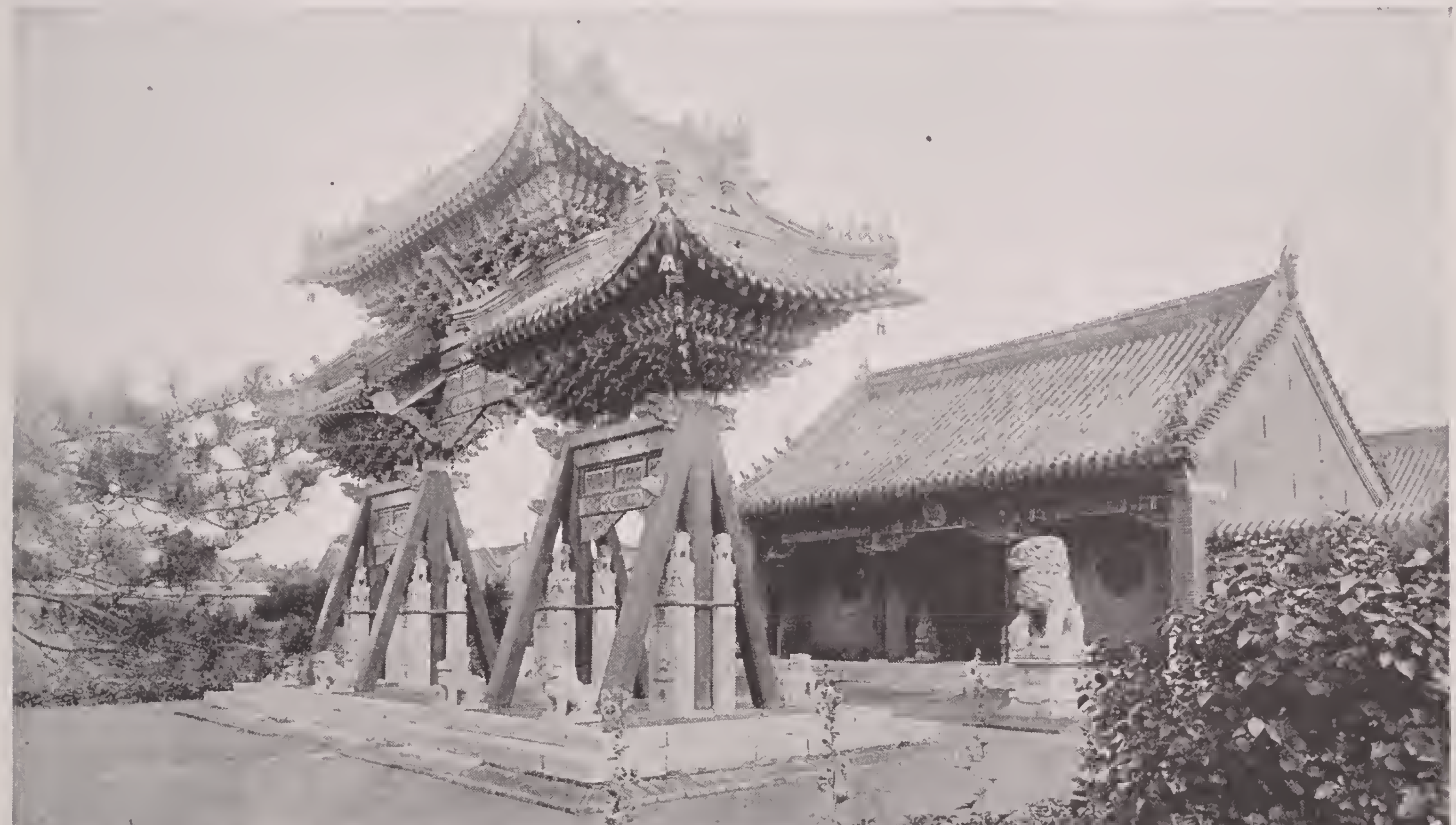
Can anything be more pathetic than this apology put in the mouth of the little Emperor, by his ministers, who were the real authors of the misgovernment? Even this humble confession did not save the throne of the Manchus, and the boy Emperor and all his kin were forced to go into retirement when China became a Republic.

YOU'RE STILL IN CHINA—BUT WOULD YOU KNOW IT?



You might think—looking down this fine street along the waterfront of the harbor of Shanghai—we were in a European or American city. At least, you might think so until you noticed those man-drawn carts or jinrikishas, in which the Chinese, like the Japanese, convey passengers. Note the clean wide street, the orderliness and well-kept appearance of the city. This is the foreign settlement, which is indeed a city in itself. When we go from here into the native quarter, we find narrow dirty crowded streets.

THE AMERICAN CONSULATE AT MUKDEN



Where do the Chinese get the fantastic forms which they use in their architecture? Look at the peculiar curves on this arched gateway. We see these same lines on the roofs of many Chinese buildings, and it is believed that they were suggested by the sagging lines of the tents used by their primitive ancestors. Gateway and house are both covered with the glazed "ridge-and-furrow" tiles of which the Chinese are so fond, and decorated with fantastic animal forms. Mukden, the capital of Manchuria, was used by the Russian army as a base of supplies during the Russo-Japanese War, and was captured by the Japanese.

nary Chinese citizen that he lavishes so much loyalty on family, community, and province that he has none left for the nation as a whole.

The relations between China and Japan especially are difficult. In 1894–95 Japan won the Chino-Japanese War, and since then China has been very much afraid of her warlike little neighbor. The victory of Japan over Russia ten years later gave the island empire the controlling position in Chinese Manchuria which Russia had formerly enjoyed. And when Japan took from Germany, in the World War of 1914–18, the port of Kiaochow and the German rights in the whole province of Shantung, a most formidable problem was created. To secure the aid of the great powers against Japan was one of the motives which led China to take the side of the United States and the Allies in their great fight with the Central European powers. In that war her chief part was to send many "coolies" to build roads in France and to do other unskilled labor in the cause of the Allies.

In 1900 the Boxers, a band of ignorant religious fanatics, rose against the foreigners. The revolt was encouraged by the Empress Dowager, and the Europeans and Americans in Peking took refuge in the British legation. They were rescued after the long and famous "siege of Peking" by an international army in which American soldiers took part. The Boxers were finally put down, and from this time forward China officially accepted western ideas of education and politics, though the minds of the people at large move too slowly to have adopted them completely as yet.

On the whole, Europe has not treated China very well. England forced the opium trade on China, encouraging the Chinese to smoke opium and so injure the health and character of the people. This bad practice the Chinese succeeded in suppressing in 1906. All the European nations have taken land from China and used her people and her resources for their own gain.

China has needed money to build railroads, develop her resources, administer her vast empire, and bring it into the modern state of efficiency desired by all patriotic Chinese. The loans made by the various Powers—Russia, Germany, France, Great Britain, and Japan—have been accompanied by "concessions" which placed large sections of the country under the economic control of these countries. It is small wonder that the Chinese, already painfully adjusting themselves to modern conditions, have been exasperated into periodic revolts against foreign nations, when they realized the extent to which the hated foreigner exploits them. The United States is an exception, for it has always tried to protect China, and after the Boxer uprising it gave back to China several million dollars of the indemnity collected. China put this money into a fund for preparing and sending students to American universities.

What of China's future? Today she is like a great

BASKETBALL AND CIVILIZATION FOR CHINESE GIRLS

There are no "lily-feet" among these girls. They are enjoying their game of basketball on the campus of a mission school quite as much as any of their white sisters ever do.

jelly-fish, lying sprawled over eastern Asia. She is all body and no head and is at the mercy of anyone who comes along. But if she ever gathers herself together and finds a head, she may again become a great country and take her place among the nations of the world. (For additional information, *see* articles on chief cities, regions, and rivers.)

A Few Odds and Ends about China

If all the people of North America were crowded into the state of Texas, the population would be only a little more dense than it is in the Province of Shantung, at the mouth of the Yellow River.

Over a great part of northern China is a very fertile soil known as "loess" which is of a yellowish-brown color (*see* Soil). The sediment of this region colors the rivers and even part of the ocean, and is responsible for the names "Yellow" River and the "Yellow" Sea.

There is no weekly day of rest in China, although there are various festivals throughout the year.

The Chinese are great breeders of ornamental plants which they force to assume the most fantastic forms; but they appear to have no idea of raising improved breeds of horses and cattle as in other countries.

All the waters of China—rivers, lakes, canals, and even ditches—are full of fish, owing partly to the artificial means by which the supply is increased.

One of China's chief needs is railroads and good roads. Some of the rich interior provinces are practically shut off from trade with the rest of China and the world because of the lack of transportation facilities. Chinese roads are generally mere tracks, covered with blinding dust or mud and impassable to horses or carts. Both men and goods are usually transported in a kind of wheelbarrow with a large wheel in the center.

Railroads, constructed usually under concessions to foreign capitalists, are rapidly increasing. At present there are more than 6,000 miles open to traffic, and more than 2,000 miles under construction.

Most of the inland trade is carried on by means of the network of rivers and canals which ramify all over the provinces. These swarm so thickly with junks and barges and smaller boats that the tonnage belonging to China is said to be almost as great as that belonging to all other nations combined.

In the new flag of China the old yellow dragon has been replaced by five stripes—crimson, yellow, white, blue, and black—to denote the five racial stocks, Mongol, Chinese, Manchu, Turki, and Tibetan.

An important event in China's history in the 19th century, not mentioned above, was the great Taiping Rebellion, which for 14 years wasted some of the fairest provinces and cost many million lives—some say 20,000,000. It began as a religious movement, like the Boxer Rebellion, but became a nationalist revolt against the Manchu rule. For a time an American adventurer, Gen. Frederick T. Ward, commanded the Imperial forces which with European aid fought against the rebels. After he was killed (1862) the task of crushing the rebellion fell to his subordinate, the picturesque British officer known as "Chinese" Gordon (*see* Gordon, Charles George).

Wung Foo's Busy Day and His Land of Queer People

WHEN Wung Foo was a boy—which was 20 or 30 years ago—he studied very hard at school, and if he learned as many as 25 new sign words, his grandmother told him stories in the evening. Wung Foo was a little Chinese boy, and was then eight years old. His father was a rich silk merchant in Canton. His grandmother was a little old lady who wore such rich clothes, painted her face so carefully, and had so many jeweled pins and flowers in her hair, that she looked quite young. Wung Foo was proud to have her lean on his shoulder when she wanted to cross the room. Her little crippled feet were only four inches long, and she had hard work walking without someone to help her.

Chinese stories for children were the scariest kind. They were all about witches and goblins and dragons. But they did not scare Wung Foo so long as his grandmother talked in her sweet sing-song way. Besides, his mother, his aunts, his sisters, his girl cousins, and his baby brother were there in the women's sitting room. Wung Foo was only a visitor there. He lived on the men's side of the house with his father, his grandfather, and his elder brothers.

Wung Foo had a chubby yellow face and bright black eyes which did not often dance with pleasure. Indeed Wung Foo was a sober little fellow, for China wasn't nearly so pleasant a place for children to be born in as America.

"Wung Foo was a small copy of his grandfather."

Wung Foo looked very fat in the winter time because he had to wear thick quilted cotton clothing. There were no stoves or furnaces to keep the house warm. And there were no soft mats on the cold brick floors; so his gold-trimmed red cloth shoes had thick white felt soles. He wore loose trousers of red silk, folded around his ankles, and a wadded blue silk coat fastened with gold buttons and cord loops. He kept his round cap on, even in the house, and was a small copy of his grandfather. His head was shaven, all but a thick black lock on top. The barber braided some long black silk threads with the hair, to make such a queue as his father still wore, and left a pretty silk tassel at the end. By and by his hair would be long and he would not need the silk, but perhaps then he would adopt the new custom and cease to wear the queue.

Wung Foo's little ten-year-old sister was a small copy of her grandmother. She was dressed almost like her brother, but her silk trousers hung loose, like a divided skirt. She lay on cushions, on a bamboo sofa, with her bound feet under her. Sometimes she cried with pain. When grandmother told a fairy story she always said: "The beautiful maiden had such tiny feet that a mandarin's son married her." Then the little girl stopped crying. By and

PERHAPS WUNG FOO NOW LIVES IN A HOUSE LIKE THIS

European influence is rapidly changing the manners and customs of the Chinese. Some of the wealthy merchants today live in such homes as this, which show European influence in their design and in the arrangement of the gardens which surround them. But however the details may change, no Chinese of means is happy until he has a pond and a garden, for the Chinese are among the most skilful and enthusiastic gardeners in the world.

by she could wear satin shoes four inches long, and have her face painted, and dress her hair with flowers and jeweled pins, and perhaps a mandarin's son would marry her. Of the hero, grandmother always said: "He learned all the 30,000 sign words, worshiped at the tombs of his fathers, and became a rich merchant." Wung Foo made up his little mind that he would be very good and study hard.

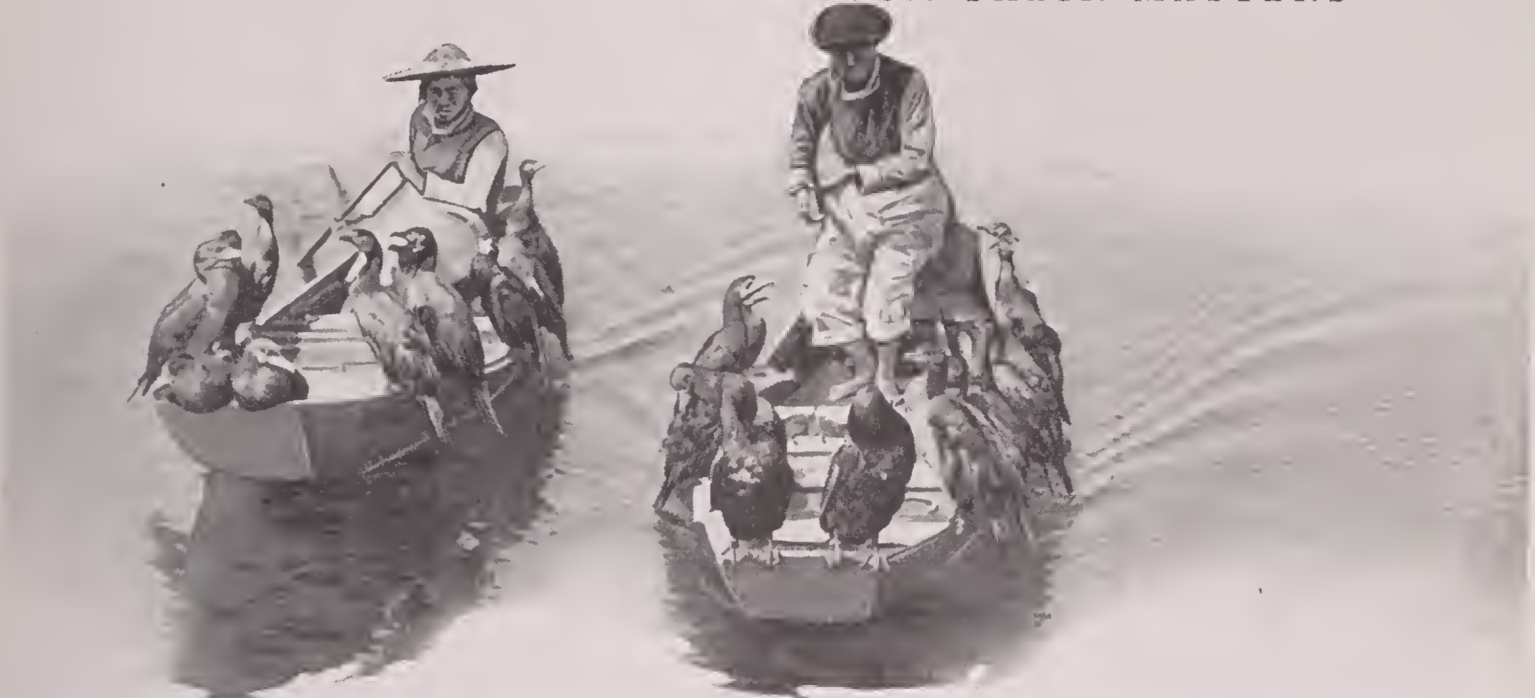
FELLOW TOWNSMEN OF WUNG FOO

This little brother and sister belong to the poorer class. They do not wear silk like Wung Foo, nor do they wear caps even when they are outdoors.

Wung Foo's home had a wall around it. It stood in a garden, with a lily and fish pond, a bridge, and a curly-roofed tea-house. The women's sitting room was very pretty. It had stools and tables of carved black wood, inlaid with pearl flowers. On the walls were hung pictures embroidered on red satin or painted on rice paper. There were vases and jars of red and gold, and blue and white. The tea trays were of silver with gold birds on them. The ladies opened and shut scented fans. They spun flax embroidered on silk and linen, and played dominoes. They had pet goldfish and singing birds. They ate a great many sweet things. When they visited other ladies they went in sedan chairs, which were cushioned and curtained boxes with doors and windows. The tops resembled Chinese roofs and the outsides were finished with gilded wood and beautifully colored felt. Men servants carried them by two poles extending out in front and behind. The ladies could not see out very well, or be seen. That was too bad, for the streets were very crowded and gay.

When Wung Foo went to bed in the men's room he pulled a down quilt over his head. He was only a little boy, after all, and in the dark the goblin stories scared him. In the morning he was awakened by a thousand noises. Watchmen told the hour on bamboo drums. Beggars beat on the gate with sticks until a servant went out with rice. Peddlers cried out that they had fish and ducks and eggs and

THESE BIRDS CATCH FISH FOR THEIR MASTERS



These are Cormorant fishermen, such as Wung Foo saw in his journey up the river. The Cormorants are trained to sit on the side of the boat and dive for fish. But why don't the birds eat the fish? Because each one of them has a ring around its neck; it can swallow the little fish but not the big ones. It drops the big fish in the bottom of the boat. When the fisherman has enough he sells them in the town.

fruits and fat puppies to sell. A procession banged and rattled and squealed Chinese music. Wung Foo thought it was very sweet music. China had always had it and China changed very little in those days. He thought the old ways of doing things the very best ways in the world.

One very old way of doing things in China was for little boys to go to school before breakfast, and to go nearly every day in the year. The chief vacations were at New Year's in February, on kite-flying day in October, and at the Feast of the Lanterns. Then firecrackers popped and snapped and banged all day long, as they do on our Fourth of July. When Wung Foo went to school there were a thousand interesting things in the crowded streets—traveling performers, acrobats, wonder workers, peep-shows, and refreshment sellers. But Wung Foo walked gravely along. When he met his schoolmates he shook his own hands inside his sleeves to show that he was glad to see them. When they got to the school the boys took their places on stools, with higher stools in front for tables; and the teacher was very cross.

MERE BABIES ARE SET TO WORK

Not more than three years old and working in the field! The children of the poor in China begin to work almost as soon as they can walk.

At ten o'clock Wung Foo came home for breakfast. At four he came home for dinner. It was a very good dinner of bird's-nest soup, fish, duck eggs, chop-suey, rice, and preserved kumquats. Chop-suey is made of bits of chicken, pork, chestnuts, mushrooms, celery, and crisp little bean sprouts, all cooked together in oil and dressed with spicy brown sauce, and it is very good indeed. Kumquats are little oranges about as big as plums. Sometimes he had chrysanthemum fritters, made of the flower petals, with pineapple sauce. Instead of a fork, he used chopsticks which he handled very skilfully.

Things Wung Foo Saw on a Journey

Once Wung Foo went on a journey with his father. He went on a boat up the river. The river was so wide there was room for sailboats in the middle, and for streets of house-boats along the banks. Women washed and cooked on the decks of the house-boats. Children played there with little barrels tied to them. If they fell into the water the barrels kept them afloat until someone could pull them into the house again. The people who lived in house-boats were poor. Boys no older than himself tended ducks in marshes. Others fished with big birds called cormorants that were trained to dive and catch fish. Then the boys would make the birds give up the fish. The little girls on the boats had big feet. They would always have to work, and they could not have done this if their feet had been bound.

Wung Foo saw other little boys and girls picking cotton bolls, and tea leaves, and mulberry leaves to feed silk worms, and planting rice in wet ground. He saw them bending over cotton and silk looms, and carrying heavy jars and tiles at the pottery works. They worked for a few cents a day. They lived in huts and ate nothing but rice and a very little fish, and drank the poorest tea.

When he went back home Wung Foo studied harder than ever. He was glad he was going to be a mandarin, or at least a silk merchant like his father. Perhaps he might go away to be a merchant in Chinatown, in San Francisco, or to Manila, in the Philippine Islands. But when he got very rich he would go back to China, and when he died his bones would be buried with those of his forefathers according to immemorial custom.

CHINCH BUG. One of the worst enemies of the corn- and wheat-grower is this tiny insect, about one-sixth of an inch in length, blackish in color, and with white wing covers marked with a dark spot and a Y-shaped line. It attacks corn as well as wheat, destroying it has been estimated sometimes as much as $60,000,000 worth of grain in the Mississippi Valley in a single year. The bugs spread over fields in enormous numbers, sucking the sap of the young plants. They are found all over the United States and in Canada, Central America, and the West Indies. Methods of fighting the pest are to burn the rubbish in which they pass the winter, and to plow a deep furrow around the field and fill it with coal-tar or petroleum to prevent their entrance. Scientific name, *Blissus leucopterus;* family, *Lygaeidae.*

The United States Department of Agriculture has declared war against this bug. It is only about one-sixth of an inch long, but it is one of the farmer's worst enemies.

CHINCHILLA. The chinchilla is a friendly little hopping creature of the rodent family, akin to the guinea-pig. It is about 15 inches long from its nose to the tip of its tail, lives in burrows, and eats vegetable food. Its home is in the Andes Mountains of South America. The beautiful soft pearl-gray fur of the chinchilla is much in demand.

Ever since the days of the old Indian kingdoms, chinchillas have been hunted. The natives employ the grison, a type of weasel, to drive them from their holes, and in this way destroy enormous numbers. Yet they reproduce so rapidly that, in many districts, their burrows completely undermine the soil, making horseback riding dangerous. Scientific name, *Chinchilla lanigera.*

CHINQUAPIN (*chĭng'kȧ-pĭn*). Dear to the heart of every boy are the sweet kerneled chinquapin nuts which fall from their prickly burrs when autumn sets in. Scarcely more than shrubs, these dwarf chestnut trees (*Castanea pumila*) flourish in the warmer sections of the Appalachian Mountains. The golden-brown fruits are to be found on sale in the southern markets in season, and barefooted boys haunt the railway stations, gleaning coin from the passengers in exchange for the nuts, strung in long chains. Unlike its larger cousins, the chinquapin bears burrs which contain but a single nut, rarely two. The name is of Indian origin.

Another nut called chinquapin is the sweet kerneled acorn of the shin oak or chinquapin oak, *Quercus chinquapina,* often no more than one foot in height, which forms miniature thickets on the barren uplands of Kansas and Missouri.

CHIPMUNK. This wide-awake, sun-loving little chipmunk, often called the ground squirrel, is noted for its beautiful markings. Its grayish or reddish brown fur is conspicuously marked with light buff stripes along the back and sides. It is about six inches long with a bushy tail nearly as long as its body. In its roomy cheek-pouches it carries surprising quantities of nuts and grains, which it stores in its underground nest for winter use.

None but the keenest eyes can discover the chipmunk's artfully concealed burrow, which is a tunnel sometimes 20 feet long. This is enlarged at intervals into chambers which serves as storehouses, and leads to a tiny nest, cozily carpeted with grass and lying well below the frost line. To provide escape when its chief enemy, the weasel, invades the burrow, another opening leads out of the far end. The chipmunk will sometimes climb a tree to escape its other enemies, the mink and the fox, but it prefers when hard pressed to make for its burrow, where it is not at the mercy of birds of prey.

LITTLE MR. CHIPMUNK IN HIS STRIPED SUIT

You can recognize the chipmunk by the stripes on his back. He is as frisky as the squirrel, but much shyer. During most of the winter he remains in his cozy nest underground.

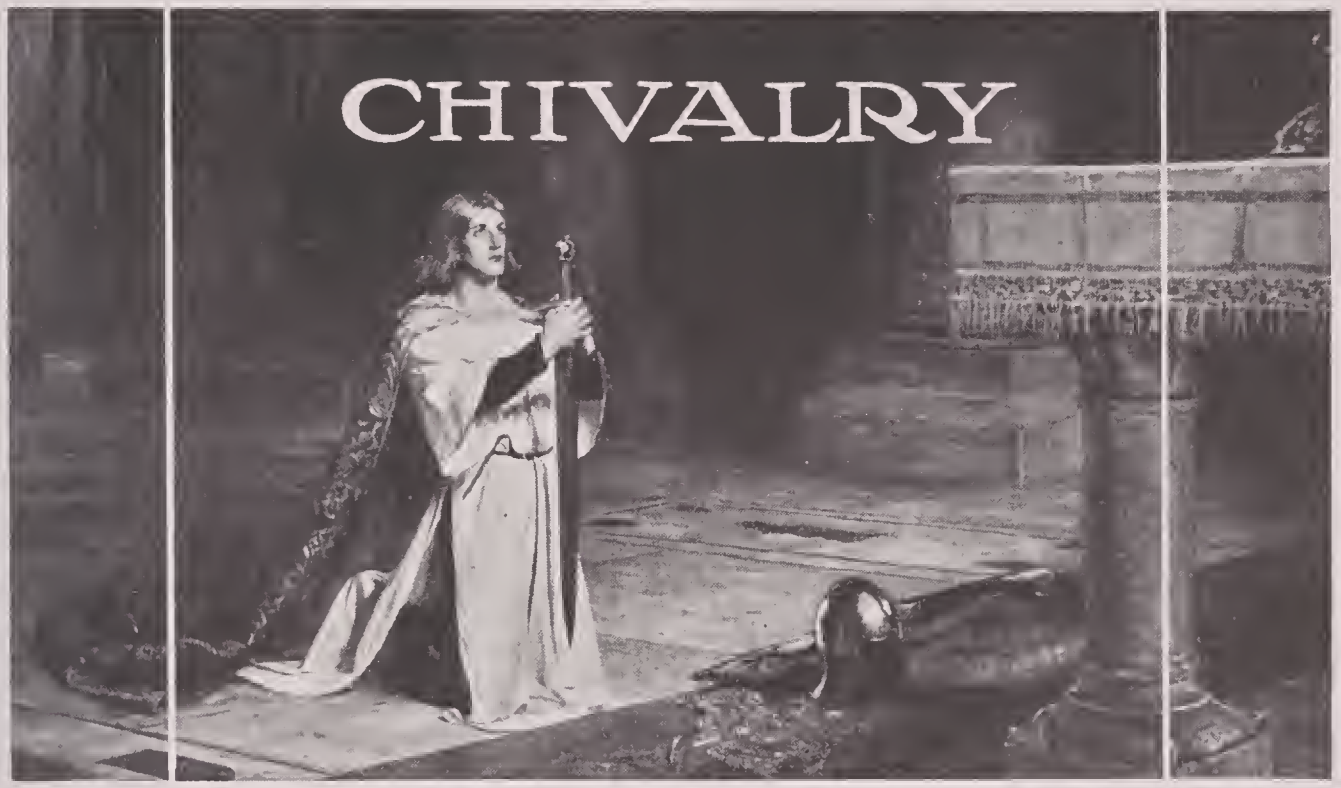
This little creature is shy in the presence of man, but loves to keep up an animated chatter with its mates. It is often seen frisking along stone walls, occasionally stopping and sitting erect to dart quick glances about it.

The chipmunk is widely distributed through North America. In the West it is sometimes quite a nuisance, since it runs off with berries, fruits, and newly planted corn. It should not be confused with the striped gopher, which it resembles.

Scientific name, *Tamias. Tamias striatus* of the Eastern states has two white stripes on the body; *Tamias quadrivittatus,* common in the Rocky Mountain region, has four white stripes; *Tamias tridecemlineatus,* a thirteen-striped variety, is also widespread in the Western states.

LITTLE TALKS ON GREAT THINGS
by Arthur Mee

CHIVALRY



ONE thing every boy must have if he would be a man indeed. One thing every girl must have if she would truly be a woman. That one thing is chivalry.

There may or may not have been a King Arthur with his Round Table, but all through this world there have been men, and women too, like him. They shine sometimes in history like bright stars in the sky. But mostly history misses them, and they belong to that unnumbered race of those who come into this world and live unselfish lives, and do great things in countless little ways, and pass unknown save by the few who never cease to mourn them. They are the chivalrous, the members of that mighty Table Round to which all heroic souls belong. They do not ride in gallant company to tournaments; their deeds are not cried out to all the world; but through their lives they sow the seeds of chivalry not less than did King Arthur's knights.

For chivalry is within the reach of all. The noblest possession of man, we can wake up, whether rich or poor, and possess it every morning. It was said of a great Roman that the elements so mixed in him—

> . . . . that Nature might stand up
> And say to all the world, "This was a man!"

And we may say of chivalry that the virtues so mix in it that Virtue might stand up and say, "This is the noblest virtue of them all."

Chivalry has in it the love of courtesy, the courage that never quails, the will to suffer pain for others, the zeal that wears life out in great causes, a boundless pity for the poor, a burning passion to right a wrong, the scorn of scorns for cruelty, and the heart of hearts for all that is generous and helpful and noble and true. A fine equipment for the battle of life is this quality of heroes, the blending of all other virtues in this matchless one.

You are never afraid of a chivalrous man. You may trust him in all times and places; you may leave everything you have in his hands. He would not do you wrong; he would not lie to you; he would die first. There was a Red Indian who made himself chief of a tribe against the tribe's will, but they had to submit because the chief had the help of American soldiers. But the tribe made up its mind in secret that if ever the chief was false to his duty he should pay the price of his falseness. They arranged with a young Sioux named Crowdog that if such a time should come the chief should be killed; and Crowdog took the vow to kill him.

The time did come, and Crowdog killed the false chief. The United States government sentenced him to death and a few days before he was to die Crowdog asked for leave to visit his wife and his two little boys. There was something fine about the men who had charge of him, and they trusted the man they had sentenced to death. They let him go home. He went home and kissed his wife and their two little boys, and then he went back to die. He was as chivalrous as the men who had trusted him; he would lose his life rather than his honor. But it is good to be able to say that he kept them both, for the story of Crowdog was told in the American papers, and it touched the great heart of the people. The story of the vow came out, and Crowdog was pardoned.

There is a story of another man who went back to die, and who did give up his life. It was Regulus in the days of Rome, when Carthage where he was a prisoner sent him to counsel his country to a dishonorable peace. He went to Rome, but urged his country *not* to make peace; and then he went back to his captors and paid for his courageous counsel with his life. There was no reason at all why Regulus should die—save that he could not love his life, "loved he not honor more." He had given his word; he would not break it. Do you remember the general in the American Revolution to whom a British officer offered a bribe of $50,000? "Gentlemen, I am poor," he said; "but your king is not rich enough to buy me." Never yet has king been rich enough to buy an honest man, and never yet has chivalry been bought. It is free wherever the sun shines, but millions of dollars cannot buy it.

Chivalry is what Tennyson says of it, in that great speech he made King Arthur say to Guinevere when he recalled to her the founding of his Table Round:

A glorious company, the flower of men,
To serve as model for the mighty world,
And be the fair beginning of a time,

He made them lay their hands in his and swear to reverence the king—

. . . . as if he were
Their conscience, and their conscience as their king;
To break the heathen and uphold the Christ;
To ride abroad redressing human wrongs;
To speak no slander, no, nor listen to it;
To honour his own word as if his God's.

And then he urged them to live sweet lives of noble deeds, with that pure love which is the most subtle master under heaven—

Not only to keep down the base in man,
But teach high thought, and amiable words,
And courtliness, and the desire of fame,
And love of truth, and all that makes a man.

Can you think of the manhood and the womanhood of the world made up of noble qualities like that? Things that break our hearts would pass away, and earth would be like heaven.

Through all the years that lie behind us our flag has stood for chivalry. It has caught in its folds the spirit of all that is best in the lives of the people. Braving the winds at sea, it has caught up the dauntlessness of men like Washington; flying over battlefields, it has caught the glow of men like Abraham Lincoln. It has shared the adventures, the thrills of pride and terror, of those who have gone out to explore new lands as Peary did; or of those who laid themselves down to die for others, as Private John R. Kissinger did in the great campaign for conquering yellow fever. Chivalry has captured the hearts of men everywhere. It is the secret of the British Empire; it is the secret of the United States and of enduring nations everywhere. It was the secret of the American and Allied armies in the World War. All the world saw then supreme examples of chivalry among great hosts of men who gave their lives for liberty.

It is for us to see that this spirit lives on, that we cherish justice to all and carry peace throughout the world. The acts of our lives make up the nation, and nothing that we do is quite without its influence in the world. Let us bear ourselves to all with courtesy and honor and goodwill; let us be ready to forget ourselves; let us suffer loss cheerfully if it must be. More than this have others borne for us, and we must not be outdone in good and noble things. We must keep burning, through whatever dark days may be, the precious lamp of chivalry.

CHLORINE. A curious element and full of contradictions is chlorine. In its pure state it is a greenish gas, so violent and poisonous by nature that it was extensively used in the deadly gas attacks of the World War. Yet, combined with the metal sodium, it forms one of the substances most necessary in our food, namely, common table salt (sodium chloride).

Between the two extremes of dealing death and helping to support life, chlorine has so many other uses that it ranks among the most valuable of chemicals. For instance, pure chlorine, which turns to a liquid under pressure and may be conveniently shipped in tanks, is often mixed in small quantities with the water supply of cities to destroy disease germs. It is extensively used as a bleaching agent, principally in the form of chloride of lime or "bleaching powder" (*see* Bleaching).

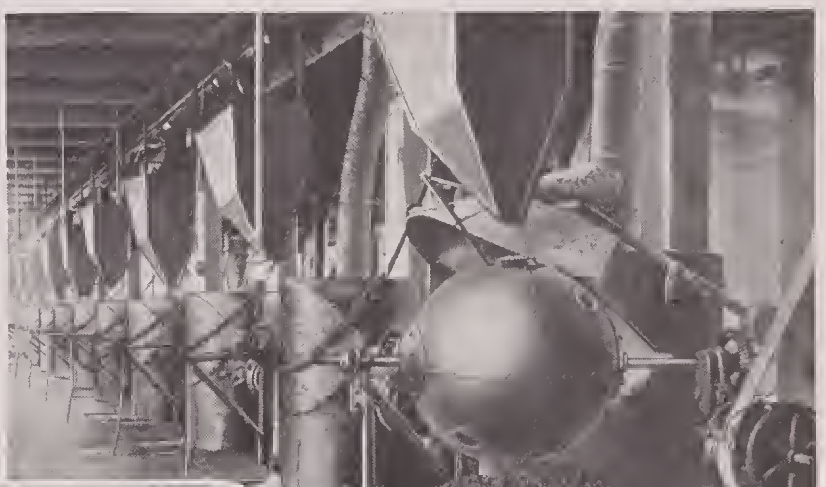
Combining as it does to form a vast number of chlorides, chlorates, etc., nearly all of which are exceedingly active, chlorine enters into many industrial processes, from the manufacture of fireworks to the extraction of gold from its ores. With hydrogen it forms hydrochloric acid (HCl), sometimes known as "muriatic acid," one of the strongest of all acids and one of the most useful. In its pure state this is a gas, but it dissolves readily in water, giving us the hydrochloric acid of commerce. It is made by heating a mixture of common salt and sulphuric acid, whereupon the acid comes off in its gaseous form, leaving sodium sulphate or "salt cake" behind (*see* Sodium). The gastric juices of man and the animals contain hydrochloric acid which plays an important part in digestion.

Chlorine belongs to a famous family of chemical elements, the halogens. A popular writer has called these the "red-headed" halogens because of their violent and unsettled dispositions. Fluorine is the most active of the group, chlorine comes next, then bromine, and last iodine (*see* Iodine). All the halogens are important in industrial chemistry. Hydrofluoric acid is so active it cannot be kept in a bottle, for it eats the glass. Hence it is used to etch patterns on glass. Bromine in combination with silver (silver bromide) forms the coating of photographic films and plates. Some bromide compounds are used in medicine.

CHLOROFORM. A colorless volatile liquid with a pungent odor and a sweet burning taste. It is extensively used in medicine, especially as an anesthetic. (*See* Anesthetics.)

CHOCOLATE. Cocoa and chocolate are made from the beans of the tropical cacao tree (*see* Cacao). Europeans first became acquainted with chocolate in Mexico, where it was a favorite beverage, and the conquering Cortez demanded 300 loads of chocolate from Montezuma, emperor of the Aztecs, as part of the tribute to be paid. Chocolate was introduced into England in the reign of Charles II, about the same time as tea and coffee, and had become a popular beverage throughout Europe by the early part of the 18th century. It was so highly esteemed that the great botanist Linnaeus gave the cacao tree the botanical name *Theobroma*, meaning "food of the gods."

TURNING "BEANS" INTO CHOCOLATE



The pictures on this page show two of the most important chapters in the history of a chocolate drop. The cacao beans are roasted in those big revolving drums shown above. These drums have automatic devices attached to them, which remove the beans from the fire when they have been cooked to the proper point. Then the beans pass to another machine, not shown here, which hulls and cracks them, and puts them through a sieve, separating the "nibs" from the germs and the husks.

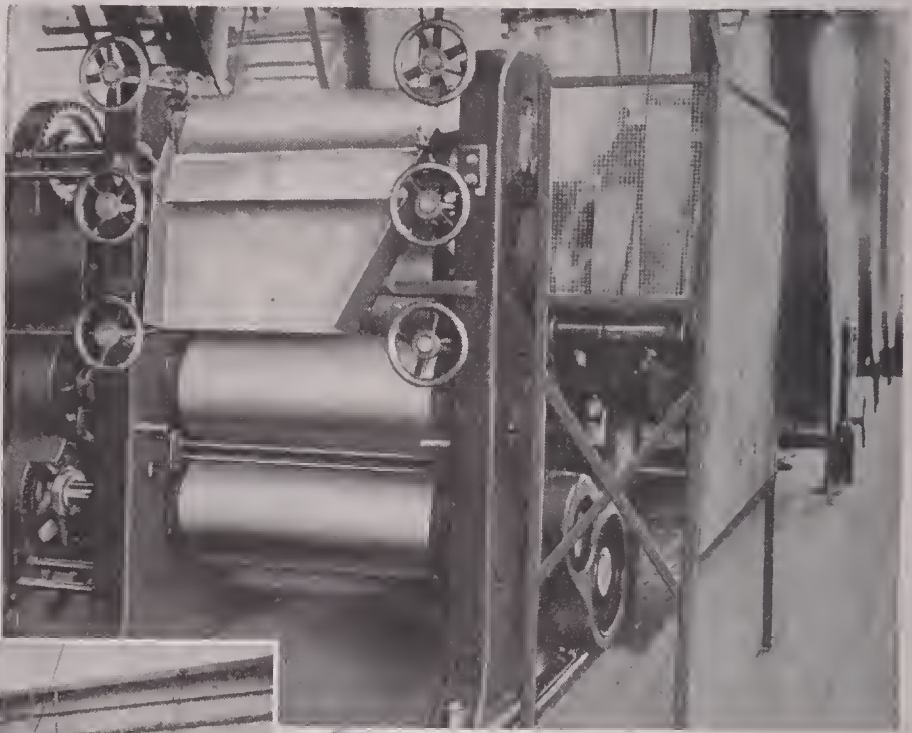
After the "nibs" are separated from the germs and husks, they pass into the mills shown here. Each mill contains three sets of granite burr-stones, enclosed in steel. The "nibs" are fed into the hoppers at the top, and become finer and finer as they pass down, emerging finally as unsweetened liquid chocolate.

The manufacture of cocoa and chocolate has become a great industry in the United States and other countries. Nearly 200,000 tons of cacao beans are used in the chocolate factories of the United States every year. The bean fresh from the pod has a very strong bitter taste, so the work of making the product appetizing begins in the tropics. When the pods have been clipped from the trees by a curved blade at the end of a long pole, they are left on the ground for a day to dry. Then the almond-shaped beans are shelled out and heaped into piles to be sweated for from 9 to 12 days. This sweating or fermenting removes some of the bitter taste and develops the rich brown color. The beans are then dried, sorted, cleaned, and graded for shipment.

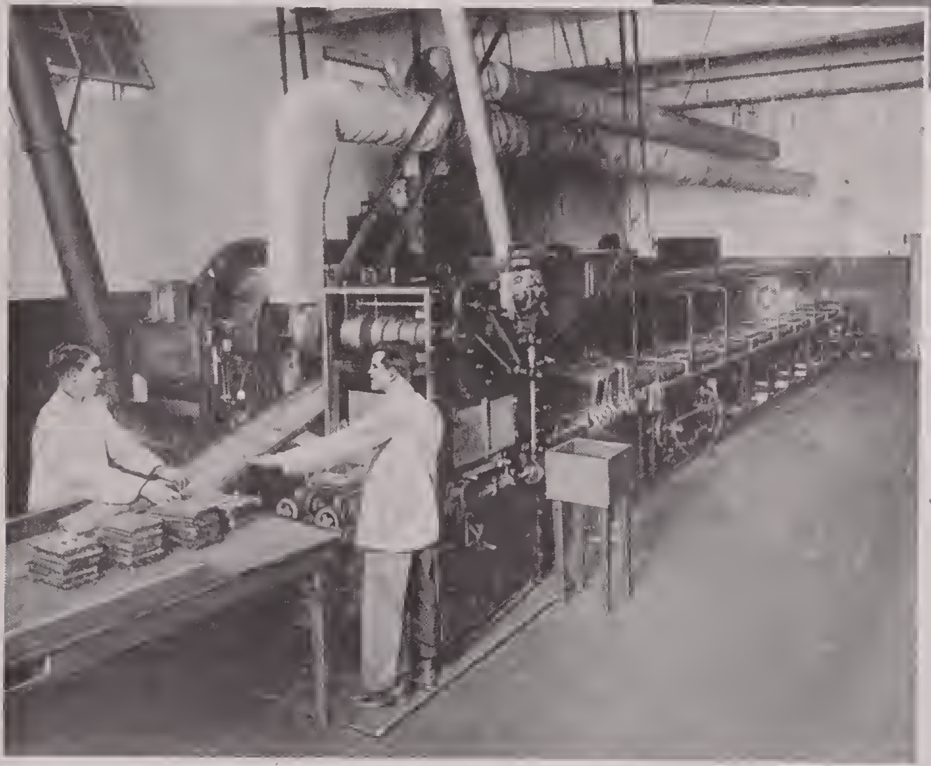
When they arrive at the factory they are put in large roasting machines. The roasting further improves their flavor and dries the husks or thin shells, so that when the beans are crushed between rollers the husks easily come off. Fanning and sifting separate the husks, the germ of the seed, and the cocoa nibs, as the main part or meat of the bean is called. The husks are sometimes used as fertilizer, as food for cattle, or as a substitute for coffee, but only the cocoa nibs are the basis for the cocoa and chocolate products.

The nibs are now ground between several sets of stones until they are perfectly smooth and sufficiently heated by the friction to flow from the mill as pure liquid chocolate. This liquid is drawn off into molds and allowed to cool. To make sweet chocolate, starch and sugar are added.

REFINING AND MOLDING CHOCOLATE



This machine for refining chocolate consists of several steel rolls revolving against each other. Milk, sugar, flavorings, and additional cocoa butter are put in during the refining process to make milk chocolate.



The last stage in the history of a chocolate bar is to pass the liquid chocolate through a cooling apparatus into the molding machine here shown. This machine presses the chocolate into molds and passes it to the "tapping table." The tapping process settles the chocolate firmly into the molds and forces out the air bubbles, thus making a smooth surface.

Chocolate is very rich in fats, so if powdered cocoa is to be made, the chocolate is put in presses which squeeze out part of the fat as cocoa butter. After cooling, the cocoa cakes are crushed in a mill to fine powder, which is sifted through a fine mesh silk, much as flour is bolted, and is then ready to be packed in tins. The cocoa butter is cooled into bars and used in making soaps and pomades and for various other purposes. It has a pleasant taste and odor and does not easily become rancid.

How the Chocolate Bars are Made

In making chocolate confectionery bars, sugar, milk, flavorings, and cocoa butter are added to the pure chocolate as it comes from the mills. After thorough mixing in machines, it is left in a hot room until properly aged. To further refine the product, it is run through grinding and rolling machines, and from these it passes through a cooling apparatus into mechanically operated molds. In making nut bars the nut meats are now added. The molds are placed on a tapping table to settle the chocolate firmly, and are left in a cool place until the bars harden. Then the bars are knocked out and wrapped in tin foil or glazed papers by machines.

Chocolate is one of the most highly concentrated foods, one pound of milk chocolate containing 2,335 calories, or nearly twice as much as a pound of beef or a dozen eggs. Half its composition is fat; starch and proteins form 32 per cent; theobromine, a stimulating alkaloid similar to the caffeine found in tea and coffee, forms 2 per cent; the rest is water and mineral salts. It is a favorite ration for explorers and soldiers because of its small bulk in proportion to the nourishment it contains. As a beverage for daily use both cocoa and chocolate are open to the same objection as coffee and tea, namely, the presence of a stimulating alkaloid. Further, while in tea and coffee only a portion of this principle is extracted in the beverage, the whole substance of the cocoa or chocolate is taken in a fine state of suspension. Children find much cocoa or chocolate hard to assimilate because of their richness, yet taken in moderation they are among the best of food-drinks.

CHOPIN (*shō-păṅ'*), FRÉDERIC FRANÇOIS (1810–1849). Chopin is the lyric poet of the piano. Although the words great or grand may not be applied to his music, the ravishing beauty and intensity of expression of his compositions have given him the highest place among lyric composers.

CHOPIN
The Lyric Poet of the Piano

Chopin was born near Warsaw, Poland. His father was a French teacher and his mother a Polish lady. They were people of culture and refinement, and besides the best of musical instruction, the boy had every advantage that loving parents could give. From the age of 12 he frequently played the piano in public, and when at the age of 20 he took up his residence in Paris, he was not only a perfectly developed musician but also a young man of most pleasing appearance, and with a wonderful intellectual beauty. Wherever he went his piano-playing held his hearers spellbound. Triumph succeeded triumph until his fame was the pride of Paris and he became the center of the leading intellectual circle of the city.

In the midst of this popularity Chopin was attacked by acute consumption. Through the care of the brilliant writer who published her books under the name of "George Sand," the progress of the malady, which all his friends believed would prove fatal, was checked. Ten years more, though now a semi-invalid, Chopin taught, composed, and played in public. Then, when less than 40 years of age, surrounded by every comfort friends and love could provide, he succumbed to the dread disease which for many years had sapped his vitality. Always of a quiet retiring disposition, he spent his last years in an atmosphere touched with deep melancholy, which is reflected in many of his compositions.

His compositions, excepting a collection of Polish songs, are almost entirely for the pianoforte. There are 56 mazurkas, likened to so many orchids; 13 waltzes, which have been called "dances of the soul"; 15 polonaises which represent the martial side of Chopin; a set of preludes which Rubinstein called the "pearls of Chopin"; 19 nocturnes of unrivaled popularity; besides numerous other compositions, all strongly marked by the Polish element which characterizes his music.

CHOSEN (*chō-sŭn'*). The official name given by the Japanese to the peninsula and former kingdom of Korea on the east coast of Asia; it means literally "the land of morning calm." (*See* Korea.)

CHRISTIAN, KINGS OF DENMARK. Of the ten kings of Denmark who have borne the name of Christian, the ninth, who ruled from 1863 to 1906, is the most interesting. In 1864 the duchies of Schleswig and Holstein were taken from him by Prussia and Austria as a result of the unscrupulous "blood and iron" policy of Bismarck. But though the kingdom of Christian IX was small and unimportant, members of his family occupied exalted positions and he has been called the "Grandfather of Europe." His eldest son Frederick VIII succeeded him as king of Denmark. Another son was chosen to be king of Greece (George I) in 1863. One daughter (Dagmar) became empress of Russia through marriage to the czar Alexander III; and another (Alexandra) was queen of England as the wife of Edward VII. A grandson also became king of Norway in 1905 as Haakon VII. Thus many of the sovereigns of Europe before the World War were related to the reigning house of Denmark.

Among the other kings bearing this name, Christian IV, who ruled from 1588 to 1648, appeared in the Thirty Years' War for a brief period as the champion of the German Protestants. The latest of this name, Christian X, "the tallest monarch in Europe," came to the throne on the death of his father, Frederick VIII, in 1912. His truly democratic spirit and ready sympathy have won for him the admiration and loyal support of all his subjects.

CHRISTIAN ENDEAVOR, YOUNG PEOPLE'S SOCIETY OF. On Feb. 2, 1881, the Rev. Francis E. Clark, a Congregational pastor in Portland, Me., gathered about 50 young people in his parlor and organized the first society of Christian Endeavor. From this small beginning the movement has spread until it includes more than 77,500 societies in all parts of the world, with an aggregate membership of nearly 4,000,000.

The different societies are independent, united only by community of principle and plan. There is, however, a corporation, bearing the title of United Society of Christian Endeavor, of which Dr. Clark became chairman. This society raises funds for the work and seeks in every way to promote the movement.

Most of the societies have a constitution that declares the purpose to be "to promote an earnest Christian life among its members, to promote their mutual acquaintance, and to make them more useful servants of God." There are active members and associate members. The former bind themselves to attend every meeting of the society to which they belong, unless prevented by absolute necessity, and to take some part, however slight, in every meeting. They are to read the Bible daily and to assist the pastor in the work of the church as he shall direct. The society is interdenominational. A special feature has always been the appointment of many committees to help in various aspects of church work.

CHRISTIAN SCIENCE. The religion discovered and founded by Mary Baker Eddy, and set forth in her work 'Science and Health with Key to the Scriptures'. Christian Scientists regard it as an interpretation and restoration of the religion taught and practiced by Christ Jesus. The Christian Science church is called the Church of Christ, Scientist. (*See* Eddy, Mary Baker.)

CHRISTIANIA. If you sail from New York on one of the Scandinavian steamship lines, on the 11th day out, and usually in the early morning, you leave the open waters of the Skagerrack and enter the beautiful inlet, Christiania Fiord. You arise very early so as to miss none of the exquisite beauty of the trip up the narrow fiord; for the dark green pine-clad mountains sloping to the deep blue waters, with the tiny villages nestled like bright spots of color at the water's edge, make a picture never to be forgotten. The fiord is studded with many islands, and deep inlets branch off from either side. After 60 miles you realize with a start that you are at the head of the bay and facing the city of Christiania, the capital of Norway.

Before you lies the harbor. Between two inlets, on a high promontory to the right is the old fortress of Akershus (built about 1300), now occupied as an arsenal and prison. On a hill to the northwest, overlooking the city, you see the royal palace, a severe but dignified building. Farther back and encircling the city are the mountains with their superb views of Christiania and the fiord. Here are the pleasure grounds of the inhabitants, because of the cool retreats of their pine forests in the summer, and the opportunities afforded by their snowclad slopes for tobogganing and skiing in winter.

In Christiania are located the buildings which house the Parliament or "Storthing," the National Theater, and the University. Near the University is the Museum of Art and a historical museum which contains two vikings' ships dating from the 9th century.

Christiania has grown considerably during the last half of the 19th century, so that it is mainly modern with handsome business buildings, several electric car-lines, good schools, and many beautiful suburbs. An interesting institution is the Steam Kitchen (1858) where good and cheap dinners are provided for the working people. There are two large ship-building yards and numerous factories. Shipping is the main industry and the chief exports are lumber and fish. About one-tenth of all the inhabitants of Norway live in Christiania.

Christiania was founded by King Harald Sigurdsson, in 1048, on the site now occupied by the suburb of Oslo. In 1624 it was nearly destroyed by fire, and the city was rebuilt on its present site by King Christian IV, who gave it his name. Population, about 260,000.

CHRISTMAS CAROLS AROUND THE WORLD

The History of the Most Joyous Feast in the Year's Calendar—How It Began and How People Celebrate It the World Over—How the Puritans Tried to Stop the Christmas Joy in Merry England and America, and Failed

CHRISTMAS. From the early centuries of Christianity, the anniversary of the birth of Christ has been celebrated by a special church festival. In early England this festival was called *Christes messe* meaning "Christ's mass," whence we get our word "Christmas." At first the date of the celebration varied in different places, some churches observing it in December, others in January, April, or May, because of the absence of historical record as to the exact date of Christ's birth. January 6 was the usual date observed in the Eastern church, as it still continues to be in the Armenian church. The celebration of December 25 spread to most parts of the Christian world in the 4th and 5th centuries; but differences in the calendar (*see* Calendar) still cause differences in the time of celebration.

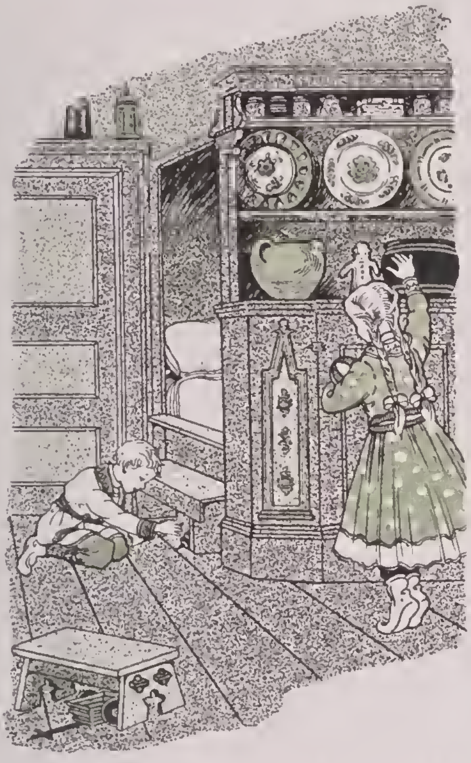
In England and America we expect "Santa Claus" to come down the chimney and leave presents in our stockings.

One of the causes that worked to establish the new festival on December 25 was probably the fact that this day marked the beginning of the great winter solstice festival of the pagan Gauls, Germans, and Britons. As in other instances where pagan festivals were replaced by Christian, many of the old pre-Christian customs and symbols were taken over. The Yule log, holly, mistletoe, and wassail bowl are all relics of pagan observances.

During the Middle Ages Christmas became the greatest of popular fêtes. Churches were adorned with rustic decorations and quaint little plays were given portraying events connected with the birth of Christ and his early years. Even today such Nativity plays are still performed every Christmas in some of the old cities of Spain. Some of the Christmas carols sung in our churches and at our community Christmas tree celebrations have come down from these early plays.

Nowhere was the Christmas festival celebrated with more pomp and merriment than in England.

In Shakespeare's time the festivities lasted until Twelfth Day or Epiphany, 12 days after Christmas day. Work was given over and all, high and low, old and young, gave themselves over to feasting and merrymaking. The Puritans, however, regarded Christmas observance as a relic of Catholicism, and in 1644 Parliament went so far as to prohibit any festivities and ordered the day to be kept as a fast. Puritans of New England also passed laws forbidding the observance of Christmas. After the Restoration, the old observances came back, somewhat subdued.



"Kris Kringle" himself hides gifts in strange places about the house for the children living in Germany and Scandinavia.

The jovial old Dutch settlers of New York, however, brought with them across the ocean the joyous observances of the fatherland. We of the New World owe our Santa Claus to them, for this jolly old saint is none other than St. Nicholas or San Nicolaas—the patron saint of children—as pronounced in Dutch.

Today the observance of Christmas is well-nigh universal throughout the Christian world. Everywhere it is above all the children's holiday. In England and America the little folks hang up their stockings in a row before the fireplace, and Santa Claus, we are told, rushing down from the north in a sled drawn by reindeer, scrambles down the chimneys and fills them from the great pack on his back. In some of the Baltic lands the gifts are supposed to be brought by the Christ child (Kris Kringle) himself. In France the children place wooden shoes on the hearth to receive the presents which "Bonhomme Noël" (Father Christmas) brings. Norwegian children have a lot of fun hunting their new toys which have been tucked away in unexpected places. In Italy presents are drawn from the "Urn of Fate"—a custom which originated in the Urn of Fate of the ancient Romans. Some of the parcels are blanks and so there is great excitement at the drawing, and disappointment at first for the little folks who do not understand that in the end there will be gifts for all.

"The Urn of Fate" provides presents for the little ones of Italy, and they watch eagerly for what it will provide.

Almost every land of Christendom has its own Christmas carols. In England "waits" sing under windows on Christmas eve, as they have done for countless Christmases. In Russia the ancient Kolyada songs, once sung to pagan gods, now dedicated to Christian saints, are sung about the streets. The French Noël songs and the famous German "Kristlieder" are heard wherever there is Christmas music. In our own land, choir boys and school children hold carol parties and go about singing these old-time songs for "shut-ins" and other unfortunates.

In France "Bonhomme Noël" (Father Christmas) will fill any little wooden shoes he sees on the hearthstone when he comes.

The Christmas tree, with its golden star and lights, and its imitation frost-trimmed boughs, is as much a part of the celebration as is the Christmas song. Some trace its origin back to Roman days, but its first appearance as a regular institution was along the Rhine some time in the 16th century. At the beginning of the 19th century the fashion spread all over Germany and by 50 years later had conquered Christendom.

In the New World, where people are gathered from all the Christian countries of the earth, many of the special observances of various lands have become a part of our celebration. Thus the practice of preparing a bird's Christmas tree supplied with bits of apple and suet, cookies, nuts, and seeds, and placing it outside in a safe place for our feathered friends has grown from the old Scandinavian custom of placing a sheaf of grain on a tall pole in the dooryard for the birds on Christmas morning. The elaborate street festivals of Italy and Spain, with their bonfires and fireworks, are, in the United States, often replaced by the community Christmas tree. A great illuminated evergreen is set up in the heart of the city, and huge crowds gather to sing Christmas songs.

The STORY of TINY TIM

"'God Bless Us Every One!' Said Tiny Tim"

TINY TIM was a little English boy. With clear blue eyes and fair hair, his cheeks should have been as hard and rosy as October apples. But they weren't. They were as soft and pale as only a little crippled boy's cheeks can be, for Tiny Tim had never walked a step without his crutch. But you must not think of him as being unhappy. He was the bravest, most contented little fellow in Camden Town, which is a shabby suburb of London.

Tiny Tim's mother said he was an angel of goodness. His big brother Peter, and his big sister Martha, and the two littlest Cratchits said so too. And his father, Bob Cratchit, was so sure of it that he was afraid Tiny Tim would slip away to heaven some day, to live with the other angels.

The Cratchits were very poor, for Bob was paid only 15 shillings a week by Old Scrooge, in whose cold dark counting-house he was employed as a clerk. But poverty could not keep such a cheerful affectionate family from having a Merry Christmas. Tiny Tim's pale little face was shining with joy when his mother began to cut up the little goose that was far too small for such a large hungry family, and he beat the table with his spoon and cried "Hurrah." And when father Bob lifted a cracked cup of water and wished them all "A Merry Christmas, God bless us," Tiny Tim responded to the toast with his favorite prayer:

"God bless us, every one!"

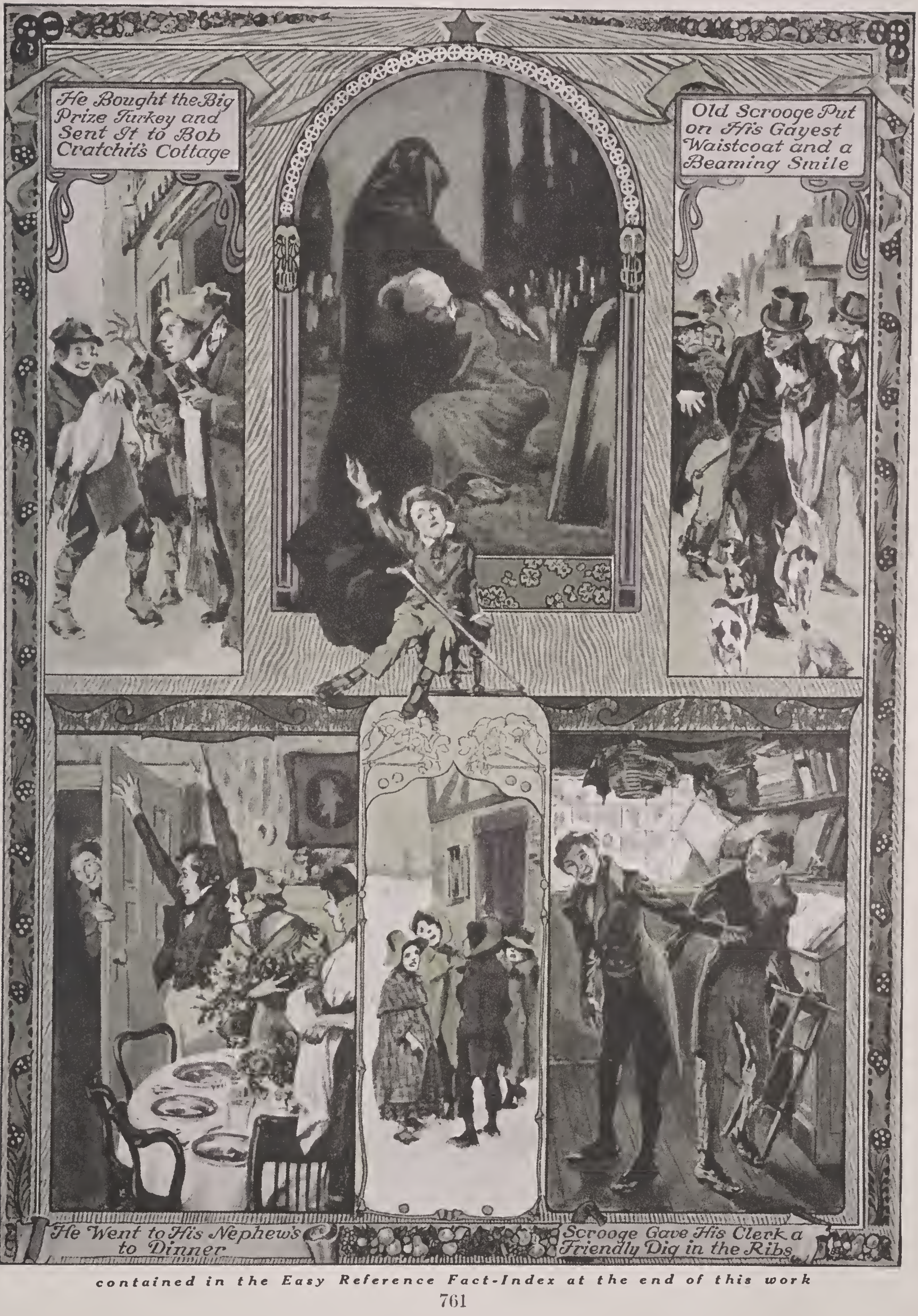
When their few friends had been toasted, and the young and old, and the sick and poor of London, father Bob lifted the cup again, and wished a merry Christmas for Old Scrooge. Mother Cratchit cried out:

"It should be Christmas Day, I'm sure, if one is to drink to the health and happiness of such an odious, stingy, hard, unfeeling old man as Mr. Scrooge!"

Remembering that it was a day of peace and good will, they all drank the toast presently, but their hearts were not in it. Old Scrooge was the wicked ogre of that little family, and even the mention of his name cast a dark and joyless gloom on the merriest of Christmases.

Old Scrooge did not deserve anybody's good will. He was so mean that he had grudged the Christmas holiday to his clerk. "You pick my pocket of a day's wages every 25th of December," Old Scrooge

THE TRANSFORMATION OF OLD SCROOGE


He Bought the Big Prize Turkey and Sent It to Bob Cratchit's Cottage
Old Scrooge Put on His Gayest Waistcoat and a Beaming Smile
He Went to His Nephew's to Dinner
Scrooge Gave His Clerk a Friendly Dig in the Ribs

had snarled, and went home to his lonely old house to have a mean miserly Christmas Eve all by himself. When he had shut out the peace and good will that annoyed him he crouched over a stingy fire to spend the evening.

Perhaps he fell asleep. Anyhow, he thought he saw three spirits—the Spirit of Christmas Past, as Old Scrooge had kept it; the Spirit of Christmas Present; and the Spirit of Christmas Yet to Come. They showed him all his meanness and the misery that he had caused others, and how he was bringing upon himself a neglected old age, a wretched death, and a forgotten grave. He was led to other homes of love and joy; and then to the poor little crowded cottage in Camden Town to see the happy family of good faithful Bob Cratchit. He heard the toast to himself, and saw the sudden gloom which the mention of his name brought.

Poor Old Scrooge! Poor, mean, stingy, cross-grained, lonely, wretched Old Scrooge! He suddenly knew how bad and pitiable an old man he was, and he envied his poverty-stricken clerk Bob Cratchit. He envied him his cheerful loving family and his cheerful loving heart; and most of all he envied him his frail little crippled boy who with the bravest sunniest smile cried out in a sweet reedy little voice like a bird's:

"God bless us, every one!"

The Spirit of Christmas Yet to Come showed Old Scrooge a vacant stool in the corner and a little crutch without an owner; and he knew that unless there was help here that money could command—good doctors, better and more food, and greater comfort in the crowded cottage—poor cheerful little Tiny Tim must die.

The Spirit vanished just as Old Scrooge woke up in his cold and cheerless old home. A sparkling Christmas morning had dawned. The whole day of Christmas Present was before him, but he was so unused to Merry Christmases that he didn't know what to do with this one. He laughed and cried both at once.

"I'm as light as a feather. I'm as merry as a schoolboy. I'm as happy as an—as dear little Tiny Tim. Merry Christmas!" He flung a window wide and shouted: "Merry Christmas! A Happy New Year to all the world! Hallo there! Hallo! Whoop!"

Old Scrooge wasn't in the least crazy, for he began at once to do kind and sensible things just like anybody else. He bought the big prize turkey in the market, and to make sure that it would get there in time he sent it to Bob Cratchit's cottage in a cab. Then he put on his gayest waistcoat and a beaming smile, and went to his nephew's to dinner like a Christian gentleman.

Bob Cratchit was 18 minutes late at the office the next morning! He started to explain to his scowling employer (who was trying to look as mean as ever and finding it hard work) that he had eaten too much of a prize turkey that had come out to Camden Town in a cab like a lord, when Old Scrooge gave his bewildered clerk a friendly dig in the ribs, raised his salary, and told him to put a whole scuttle-full of coal on the office fire at once.

That very day, after Merry Christmas, he began to be a second father to Tiny Tim. The darling child simply *couldn't* die as long as there were good doctors, good food, and other comforts in the world, and Mr. Ebenezer Scrooge had a pocket full of money. And the next Christmas, when the little crippled boy was stronger and heartier, you may be sure that all of the happy Cratchits thought first of their dear good friend, Mr. Scrooge, when Tiny Tim responded to the toasts with his loving prayer:

"God bless us, every one!"

—Adapted from Dickens' 'A Christmas Carol'.

CHRYSANTHEMUM. When the summer flowers have disappeared and the cold winds of autumn blow, the bright-colored chrysanthemum shows forth in all its glory. In favorable seasons it continues to bloom well on towards Christmas.

This varied flower, symmetrical or ragged, prim or buoyant, straight or curled, less than an inch to eight inches in diameter, streaked, spotted, or single-hued, ranging in color from white or yellow to lavender or deep red, is one of the most popular flowers in the world, ranking fourth in importance in the United States as a commercial flower. Because of its easy cultivation, the chrysanthemum can be used to advantage by amateur gardeners and is widely employed as a border plant, its propagation being secured by means of cuttings. The small pompons and the immense "show" flowers are little grown out of doors, for they require more care than the medium-sized ones, and if left to themselves out of doors, would speedily lose the special features that make them valuable. Yellow and white are the prevailing colors, the name itself meaning "golden flower." All varieties are either scentless or have a slightly disagreeable odor.

Although hundreds of different varieties, wild and cultivated, are now found in all countries of temperate climate in the Northern Hemisphere, the original home of the chrysanthemum was in China. From China it was introduced into Japan 2,000 years ago, and there, in the 14th century after the "War of the Chrysanthemums," which lasted 56 years, the flower was adopted as the heraldic emblem of the imperial household, and today vies with the cherry blossom in popularity among the Japanese people. It was brought to Europe in 1764 and later to America, everywhere gaining immediate popularity. The more showy varieties of "mums" are of comparatively recent origin, the result of skilled selection and cultivation.

The chrysanthemum belongs to the aster family (*Asteraceae*). Most important parent species, *Chrysanthemum indicum* and *Chrysanthemum morifolium*.

CHURCH, CHRISTIAN. Calmly the aged pope, Leo the Great, faced the grim warrior Attila. The leader of the Huns, who delighted to be called the "scourge of God," had led his ruthless hordes into Italy, and the whole peninsula lay defenseless before them. In a last effort to avert ruin the gray-haired pontiff had led an embassy to the king of the Huns, and now addressed him in these words:

"The senate and the people of Rome, once conquerors of the world, now indeed vanquished, come before thee as suppliants. We pray that thou who hast conquered others shouldst conquer thyself. The people have felt thy scourge; now as suppliants they would feel thy mercy."

While Pope Leo spoke, Attila stood silent as if thinking. Suddenly, according to the legend, there were seen the Apostles Peter and Paul, clad like bishops, standing by Leo, the one on the right, the other on the left. With swords outstretched over Leo's head, they threatened Attila with death if he did not yield to the pope's entreaty. And Attila, who had raged as one mad, promised a lasting peace and withdrew beyond the Alps.

The New Empire of Rome

And because the pope had succeeded in doing what the incompetent emperor had failed to do, in saving Rome from the Huns, his power in the western empire became all the greater. As successor to Peter, the chief of the apostles, the pope was head of the church founded by Christ. When Rome had fallen; when the "Eternal City," once proud mistress of the world, had been captured by the barbarian hordes who came down from the north; when officers of the empire deserted their posts in fear—the officers of the church took up the work they laid down. The empire of Christ succeeded to the empire of the Caesars; and the pope, or "Father" at Rome, stepped into the place of the emperor.

But just as the Roman Empire had split into an eastern and western section, so the church (after 1054) divided into an eastern (or Greek) and western (or Roman) Catholic church. And it was only over the western half of Europe that the pope's power was canonically recognized. There he was the greatest ruler of the Middle Ages. At times he even made and unmade kings.

To assist him in the work of governing the church, caring for its great estates, and ruling the city and district of Rome, a council was gradually formed, the members of which were called cardinals. After 1059 this college of cardinals became extremely important, for when a pope dies it has the power to elect his successor (*see* Cardinals, College of).

The next highest officers of the church are the archbishops. In addition to his work as bishop of one of the dioceses of his province, the archbishop has power over the bishops of his district, in matters touching all the dioceses in the province.

The word "bishop" means "overseer" and this aptly describes that officer's work. He watches over the diocese, visits the priests in their parishes, and consecrates churches. His church or *cathedral* is located in the chief city of the diocese and is usually the largest and finest church in the district. To help him in the cathedral services, the bishop had associated with him a body of clergy called the "canons," who were known collectively as the cathedral chapter. As the church acquired property through the gifts of religious people, the bishop frequently had to administer large estates as well as perform his religious duties. Furthermore, in his court in the Middle Ages were tried cases concerning wills, marriages, etc., and all cases involving his clergy.

The People and the Parish Priest

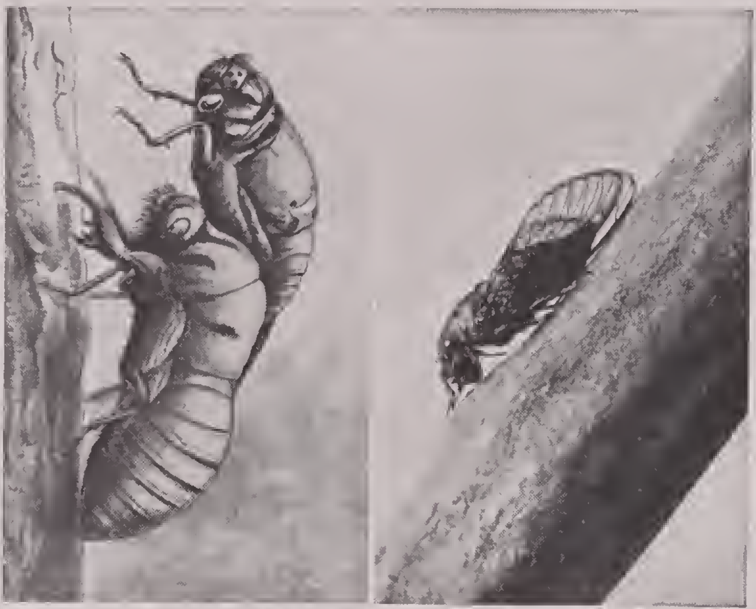
But the officer who brought the work of the church home to the people was the humble parish priest. To him the people turned in all their joys and sorrows. He baptized their children, married their young people, and buried their dead. To him the people confessed their sins, receiving absolution, and performing the penance he imposed.

It was because of this strong organization that the church was able to stand firm when all else was chaos and it seemed as though learning and literature would be blotted from the earth. At the time when there were no printed books the churchmen copied by hand the ancient manuscripts, thus preserving for us the priceless heritage of Greek and Roman culture. And at a time when no one else took the trouble or knew how to write a history of the events that were taking place, the monks in most of the monasteries wrote "annals" or "chronicles," in which the events of each year were set down. They also gathered about them boys whom they taught to read and to write, so that there might always be learned men to carry on the work of the church; and these were the only schools of that time. In addition to the ordinary clergy there were also the monks, who besides their religious duties labored in the fields and taught the peasants the best methods of farming. When travel was dangerous and accommodations for the traveler few, the monasteries served as hostels and hospitals. The church as a whole took under its protection the widow and the orphan, and it distributed alms to the poor. It was the organized church, also, which carried Christianity to the heathen, until the whole of Europe—and even beyond—was Christian.

The Great Councils of the Church

From time to time, to decide great questions which concerned the church, general or "ecumenical" councils of the church were called. The first of these, held at Nicaea, in Asia Minor, in the year 325, condemned the Arian heresy, which concerned the church teaching as to Christ the Son and God the Father in the doctrine of the Trinity. From time to time other great councils were held, of which the Lateran Council of 1215, held in Rome, was one of the most important in the Middle Ages. Then in the 15th century a series of "reforming" councils were held to correct certain abuses which had crept in, and to decide which of several claimants was lawfully pope. The chief of these councils were held at Pisa (1409), Constance (1414–18), and Basel (1431–49). In part out of these councils, in part out of national grievances in Germany and elsewhere, and in part out of new religious ideas held by men like Luther, Zwingli, and Calvin, came the great break in the ranks of the church in the 16th century which is known as the Reformation. (*See* Reformation; for the many Protestant sects which then or thereafter arose, *see* the article Religions of the World.) Other church councils of importance were the Council of Trent (1545–63), which condemned and checked the Protestant movement; and the Vatican Council of 1870, which proclaimed the pope's infallibility in questions of faith and morals.

HOW THE CICADA IS BORN AGAIN



Here you see the Cicada pulling himself out of his old shell. A large part of his body has already emerged. On the right is an English Cicada drying his wings, after his "second birth."

The people in the church were divided into two great classes, the *laity* or ordinary members, and the *clergy* or officers. The latter were distinguished by shaving the crown of the head (*tonsure*), and by their distinctive dress. They were also required to take a vow not to marry, known as the vow of *celibacy*. They enjoyed the *benefit of clergy*, the privilege of trial by a church court.

There were two classes of clergy, the *regular* clergy (monks and friars), who lived according to rules (*regulae*), and the *secular* clergy, those who lived in the world, as priests, bishops, etc.

The sacraments of the Roman Catholic church are seven in number. *baptism*, by which a person is made a member of the Christian community; *confirmation*, by which he is admitted into full church membership; the *Holy Eucharist* or Lord's Supper, at which the participant partakes of the body and blood of Christ under the forms of bread and wine; *penance*, which includes confession to the priest, at least once a year; *extreme unction*, or the anointing with oil of those about to die; *ordination*, whereby a layman is made a member of the clergy, and *marriage*. The *Sacred Host* is the consecrated bread of the Lord's Supper.

The chief teachings of the church were set forth in the writings of the early *Church Fathers* of the 2d to the 5th centuries. The chief of these were Ambrose, bishop of Milan; Basil, the promoter of monastic life; Jerome, who prepared the standard Latin translation (Vulgate) of the Bible; and Augustine, bishop of Hippo, the great theologian.

The doctrine which more than any other caused the break in the church in the 16th century was that of *Transubstantiation;* this teaches that the substance of bread and wine in the sacrament of the Eucharist is changed into the living (or real) body and blood of Christ.

To aid in maintaining the discipline of the church, *excommunication* and the *interdict* are used. By the first an individual is excluded from the fellowship of the church; in the Middle Ages excommunication made him an outlaw from society. By the interdict a whole community is denied church services.

CICADA (*sĭ-kā'dȧ*). Seventeen years of slumber in the ground, five weeks of joyous life in the light of the sun, and then death—that is the life history of the mysterious little creature called the cicada, perhaps the longest-lived of all insects. Why does nature take so long to develop this little winged insect, when she makes a full-grown lion in three years, a giraffe in four, and a rhinoceros in fifteen? That is one of the questions no one can answer. All we know is that the *nymphs*, as the cicada's young are called, drop from the tree branches where they have hatched from eggs, burrow into the ground, attach themselves to rootlets, and remain there motionless, sucking the sap, until 17 years later some mysterious instinct calls them out into the light. They climb the trunk of a tree, their skins split open, and out come the mature cicadas, to make the air resound for their few weeks of life with their shrill ear-piercing song.

Only the males can make this noise, which led an ancient Greek to say, "Happy are the cicadas' lives, for they have voiceless wives." The noise-making apparatus is the most complicated musical organ in nature. It consists of little drum-like plates at the base of the abdomen, which are vibrated rapidly by tireless muscles.

AFTER SEVENTEEN YEARS IN THE GROUND!

No wonder the Cicada seems crazy about sunlight when he gets back into it after 17 years underground! He just sings all day long! These holes are made by the nymphs of "17-year locusts," some of whom you see just as they have come out of their cells.

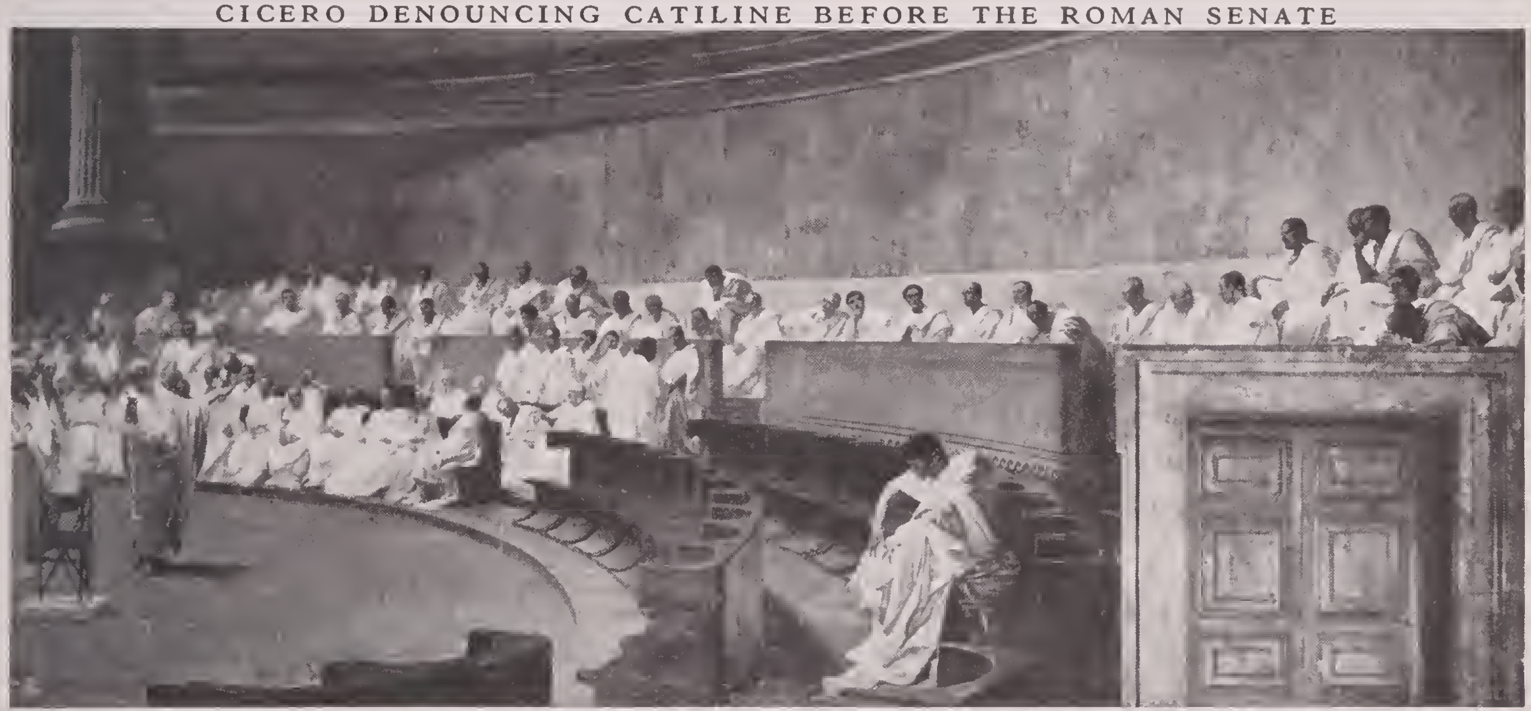
Shorter-lived cicadas are found in all warm countries, but the 17-year cicada is peculiar to the United States. Another variety, the 13-year cicada, is found in the southern states. The commonest variety is the black and green harvest-fly or "locust" which is supposed to live only two years. There are two broods of this species, so harvest-flies appear every year. There are about 30 broods of the longer-lived species, all carefully mapped out, so it is known just where and when the next brood will appear. Two immense broods appeared in 1919 throughout 20 states.

Cicadas used to do immense damage to orchards. The female lays its eggs—from 400 to 600—in slits which she cuts in the twigs of trees. In about six weeks these punctured twigs fall to the ground and the young nymphs hatch out. The long-lived species have been greatly reduced in numbers by the attacks of the English sparrow. The 17-year cicada is sometimes incorrectly called the 17-year locust. (*See* Locust.)

Scientific name of 17-year cicada, *Cicada septemdecim;* 13-year, *Cicada treddecim;* harvest-fly, *Cicada tibicen.* Order, *Hemiptera.*

CICERO, MARCUS TULLIUS (106–43 B.C.). A tall slight man with fury in his eye took his place in the Roman Senate on the 8th of November, 63 B.C. It was the silver-tongued Cicero, whose eloquence and statesmanship had raised him from obscurity to the highest office in the Roman republic—the consulship. Only the day before, he had escaped death at the hands of conspirators plotting the overthrow of the government; and now the toga-clad assemblage awaited in restless silence the sequel of that attempt.

CICERO DENOUNCING CATILINE BEFORE THE ROMAN SENATE



"Cicero turned upon him with accusing finger. Then, in the most famous of his 'Orations against Catiline', he exclaimed in passionate denunciation: 'How long, O Catiline, will you abuse our patience? To what length will your unbridled audacity carry you? Do you not see that your conspiracy is known to all here? Long ago, Catiline, you ought to have been led forth to execution'."

A man of immense stature stalked in. His pallid cheeks and bloodshot eyes betrayed the guilty fear that lurked under his insolent bearing.

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"How long, O Catiline, will you abuse our patience? To what lengths will your unbridled audacity carry you? Do you not see that your conspiracy is known to all here? Long ago, Catiline, you ought to have been led forth to execution."

Unabashed, Catiline tried to reply, but cries of "Traitor!" drowned his words. With threats and curses he rushed out of the Senate and escaped by night from the city. An army was presently sent against him, and this "most diabolical of men" was soon defeated and slain.

Cicero was now at the height of his power, but his hot eloquence had carried the Senate too far. Some of Catiline's band had been put to death by a simple order of the Senate, a stretch of power for which Cicero was held responsible; and "the Father of his Country," as he had been called but a short time before, was banished and his two houses were plundered. Though the changing populace welcomed him back with shouts in the following year, he never regained his former power.

During the next ten years, while the republic was crumbling to pieces and Julius Caesar and his associates were erecting on its ruins the foundations of the empire, Cicero took little part in public life. His dream was to create a new party, which should restore the republic as it had been in the days of its greatness. But he was doomed to sit helplessly by while stronger men remade Rome.

Once only, after Caesar's assassination, did Cicero again take the center of the stage. He put himself at the head of the republican party, denouncing Mark Antony in the famous set of speeches called his 'Philippics'.

These cost him his life. Antony's proscription list of his enemies when he came to power contained the name of gentle, amiable scholarly Cicero. Old and feeble, he fled, pursued by Antony's soldiers. He was overtaken as he was being carried in his litter down to the shore to embark, and his head and hands were there cut off. The grewsome relics were carried to Antony, who caused them to be nailed to the Rostra (the orator's platform in the Forum), to moulder there in the spot which had so often been the scene of Cicero's triumphs. A sadder sight was never beheld in Rome.

More of Cicero's writings have come down to us than of any other Latin author. Most interesting of all is the great collection of hundreds of letters to his friends, including nearly all the great men of his day. Nowhere else do we get so complete and intimate a picture of Roman life, and of the world-shaking events through which Cicero lived. The letters also serve to make Cicero one of the most real and vivid personalities to us of all the great men of antiquity. Here we see the great statesman as a passionate collector of books and works of art, as a lover of country life, and—best of all—as a proud and devoted father, telling anecdotes of his only son and his "darling little daughter," as he calls her.

We also have about 50 of the speeches which made Cicero famous as the greatest master of style who ever wrote in the Latin language and one of the greatest orators of all time. Several of his philosophical essays have also been preserved, which scholars still read with delight for their graceful style and urbanity of spirit.

CINCINNATI, OHIO. The city that owns a railroad! Cincinnati is probably the only city in the world, certainly in the United States, which has this distinction. Stretching southward from Cincinnati to Chattanooga and crossing two states, this road, the Cincinnati Southern,— with its right-of-way 100 feet wide and 338 miles long, and its stations, rolling stock, and equipment—is the absolute property of Cincinnati.

The city completed the line in 1880 to open up a way to the South for its tremendous manufacturing output. No private company could be found to undertake this project, because of the cost of constructing bridges across four great rivers—the Ohio, Kentucky, Cumberland, and Tennessee—and the 27 tunnels in the mountainous country. So the municipality itself pushed this unique work through with the result that it opened up a huge new era to commercial development, and the business of Cincinnati was correspondingly increased. And today this railroad, which is operated under a lease from the city, yields to the city treasury a net revenue of more than a million dollars a year.

Nearly 20 other railroads serve Cincinnati, which is one of the chief manufacturing cities of the country, turning out a variety of products, including machine tools, soap, clothing, boots and shoes, meat products, furniture, leather, rolling mill and foundry products, lumber products, and electrical machinery. The Rookwood Pottery, established in 1880, is renowned for its fine wares. Much of Cincinnati's early importance sprang from its location midway on the great Ohio River, which even today carries a large part of the city's bulky freight—coal, ore, lumber, etc.—at very cheap rates. For half a century Cincinnati has also been noted as a great musical and educational center. Its May musical festivals held every two years are world-famous, and its symphony orchestra is one of the best. The University of Cincinnati, founded in 1874, is one of the foremost municipal universities, and Lane Theological Seminary was famous before the Civil War because of the anti-slavery sentiment of its students and faculty.

Cincinnati is, moreover, a city beautiful. It nestles in the northern half of a semi-circular valley some 2½ miles in diameter, cut by the restless river from the gray cliffs, 450 feet high. On the south bank of the Ohio are the Kentucky suburbs of the city. Cincinnati itself is built on two big steps or terraces—reached in some places by inclined plane cable railways—the first 60 feet, and the second 112 feet above the river. The river terraces, which protect it from floods, and Mill Creek, which winds into the valley from the north, providing an easy way into the interior, are important factors in Cincinnati's growth.

Cincinnati was settled in 1788. Two years later it received its present name after the Society of the Cincinnati, a society of Revolutionary officers, many of whom, like the Roman Cincinnatus, had left the plow at their country's call. At first the village clustered close about a fort built there, but in 1795 the Indians of the district were crushed and settlement became safe. Until 1801 Cincinnati was the capital of the Ohio territory. It grew rapidly and was incorporated as a city in 1819. For many years it was the largest city of the West, and was called the "Queen City." As its trade in pork was the largest in the country, until 1863, it was also nicknamed "Porkopolis." Leading events in the economic history of the city are the passage of the steamboat *New Orleans* on its trip from Pittsburgh to New Orleans in 1811; the opening of the Miami Canal in 1827; and the completion of the first railroad into the city in 1846. The 20 years before the Civil War saw a great German immigration, giving the section of the city north and east of the canal the name "Over the Rhine." Few cities have a larger proportion of American-born inhabitants than Cincinnati. Population, about 405,000. Approximately 1,000,000 people live within one hour's ride of the center of the business district.

CINCINNATUS, LUCIUS QUINTIUS (born about 519 B.C.). Rome was in danger. A band of Aequians, a sturdy people who lived on the slopes of the mountains east of Rome, had marched into Roman lands and had begun to burn and plunder. They had laid siege to the camp of the Roman army sent out against them, and held it as if in a trap. In desperation the Roman Senate turned to Lucius Quintius, who was called "Cincinnatus" on account of his crisp curly hair. They made him dictator—that is, as long as the danger lasted he was to have the powers of the ancient kings, and the people should obey his commands without question.

Although Cincinnatus was a patrician or noble, he was poor and tilled his own farm of four acres on the other side of the Tiber River. When the messengers brought him the news that he was appointed dictator, he left his plowing and hurried to Rome. He commanded all who were of an age to act as soldiers to meet him before sunset, and after dark he led them out of the city to the camp of the Aequians. These enemies were easily defeated, for they were attacked from both sides at once, and besides, they were fighting unknown numbers in the darkness of the night.

Cincinnatus was not made vain by his great victory, and 16 days after he had been made dictator he laid down his great power and returned contentedly to his farm. For giving up his power so easily he has been as much admired as for his success as a general. When George Washington and other Revolutionary officers laid down their offices at the close of the war, they formed a society which they named "the Cincinnati" in honor of the Roman general whose example they were following.

CIRCE (*sẽr'sē*). In the 'Odyssey' of Homer we read of this famous sorceress who, by means of drugs and spells, had the magic power to turn men into swine and other beasts. She was said to be the daughter of the sun-god Helios and an ocean nymph. How Odysseus (Ulysses) and his companions were blown to the shores of her island, and what befell them there, is told in the accompanying story. Because he had help from the gods, Odysseus escaped her charms and forced her to restore his companions to the form of men. Perhaps this myth was meant to teach that yielding to base temptation changes men oftentimes into beasts. (*See* Odysseus.)

Homer's Story of Odysseus and Circe

JEALOUSY and greed brought black disaster upon the companions of Odysseus (Ulysses) when they were already in sight of Ithaca, their native land, for which they had so longed during their ten years of fighting before Troy and their months of voyaging through strange perils. To speed them on their homeward way, Aeolus, god of the winds, had given Odysseus all the contrary winds bound in a bag. Then he sent the gentle West Wind to waft the weary adventurers to their island home.

For nine days Odysseus held the sheet while the ship drove steadily on its way. When they were already in sight of the beacon fires of Ithaca he was overcome by sleep. His men had been covetously eying the mysterious bag. "Look!" they said; "we are returning with empty hands, while Odysseus has much goodly spoil. And now Aeolus has given him this bag of treasure. Let us open the wallet and see what wealth of gold and silver it contains."

So they cut the bag open and instantly the angry winds rushed out in a furious storm that drove them back to the island of Aeolus. "Begone!" now cried the king of the winds. "It is clear that you are hated of the gods."

Stricken at heart, they put out again and were driven by contrary winds until they came to a beautiful island. Odysseus did not know that it was the home of Circe, a daughter of the sun and an enchantress. Seeing smoke rising from a wooded hill, he sent his kinsman Eurylochus with half his men to learn who dwelt there.

In the wood they found a gleaming marble palace, guarded by tamed lions and wolves who fawned upon them like dogs. Within sat a lovely fair-haired lady, weaving at her loom and singing sweetly. With kind words and charming manners, Circe invited the strangers into her palace.

The others went, but Eurylochus, fearing treachery, stayed without. Within the shining doors she made them a mess of cheese and barley-meal and yellow honey with wine, and mingled baneful drugs with the food to make them utterly forget their own country. When they had eaten, the sorceress presently smote her guests with the wand, and lo! they were instantly turned to swine. They had the shape and voice and bristles of swine, but their minds were unchanged. So she drove them weeping into pigsties and flung them acorns to eat.

Eurylochus, horror-stricken at the sight, fled to Odysseus and told him of the dreadful enchantment that had been put upon his men. Drawing his sword, Odysseus strode alone through the charmed wood to the palace of Circe. The enchantress welcomed him and gave him the magic drug in a cup of gold. But when she had smitten him with her wand and saw that he did not turn into an animal, she fell on her knees, thinking him a god. Never before had mortal man withstood her sorceries. In truth, Odysseus was protected against her magic by the white flower of the *moly*, a plant sacred to the deities. Hermes (Mercury), the messenger god who wore winged sandals, had overtaken him on the way and given him the flower.

Unable to bewitch Odysseus, she turned her arts to his service. She changed his comrades back into men; and by her kindness she so wrought upon them that they dwelt there for a twelvemonth, while she entertained them with every sort of luxury and pleasure. In her beautiful palace she "rocked the tedious year as in a delightful dream." The only thing she refused her guests was to let them go.

At last, because Odysseus became melancholy with longing to see his wife and son Telemachus, she consented to let him depart. But first she obliged him to visit the land of the dead, from which no mortal had returned. When he came back in safety she stored his galleys with bread and meat, warned him of dangers that lay before him, and told him how he might avoid them. Then, standing on the shore with her nymphs, the enchantress bade him a sad farewell. —*Retold from Homer's 'Odyssey', Books* x *and* xii.

CITIZENSHIP. About 62 years after the birth of Christ, the apostle Paul saved himself from unjust punishment by asking the official, "Is it lawful for you to scourge a man that is a Roman citizen?" For hundreds of years the proudest boast that a man could make was *Civis Romanus sum* ("I am a Roman citizen"), and the power of the mighty Roman Empire was exerted to protect that man in any part of the known world.

In the same way the great nations of the world today protect their citizens wherever they go. If an American citizen is in China and finds himself in trouble or danger, he appeals to a United States consul or diplomatic agent for aid and protection. When he leaves his own country the government gives him a passport stating that he is a citizen in good standing and this is his security wherever he goes. Within a country little distinction is made between aliens and citizens, so far as civil rights are concerned; but aliens are generally excluded from political privileges, including the right to vote and hold office. Suffrage, however, does not necessarily follow upon citizenship. Women are citizens, but along with minors and illiterates they were long excluded from the right to vote. Citizenship means simply membership in a state, and the term is used with reference to a monarchical form of government as well as a republic.

By the 14th amendment to the Constitution, "All persons born or naturalized in the United States, and subject to the jurisdiction thereof, are citizens of the United States and the state wherein they reside." Even Chinese and Japanese boys and girls, when born in this country, are citizens, although their parents cannot by law become naturalized. This rule does not apply to Indians still living under a tribal form of government; but it does apply to many Indians not living on reservations on whom Congress has conferred citizenship. The children of foreign diplomatic representatives born abroad are citizens of the country which the father represents. In the same way children of American citizens born abroad are United States citizens, if, during minority, they return to America with the intention of living there permanently. A resident foreigner may acquire citizenship by naturalization and his wife and minor children also become citizens by his act (*see* Naturalization). Since the rule is that the wife's citizenship is the same as her husband's, women lose their citizenship by marriage to aliens.

Generally speaking, citizenship can be lost in only one way—by formally renouncing one's citizenship and taking the oath of allegiance to some other country by the process of naturalization. Long residence abroad does not annul citizenship, except in the case of naturalized citizens; and even they may retain it by declaring their intention to an American diplomatic official. Partial loss of citizenship (such as the right to vote) is sometimes inflicted by the courts as a penalty for crime.

A citizen may not be "deported," but an "undesirable alien" can under certain conditions be sent back to his native land. In European countries exile, so frequent a punishment in ancient Greece and Rome, is still sometimes inflicted by the courts.

CITRON. The true citron (*Citrus medica*) used in our fruit-cakes and Christmas puddings grows on a small evergreen tree about ten feet high, usually in the same regions that produce lemons and oranges; for it is indeed one of the "citrus fruits," which include the lemon, orange, grapefruit, etc. The fruit looks very much like a great rough lemon, five or six inches long. The center has a thick whitish flesh, while the skin is relatively thin and very fragrant. The Chinese sometimes use it as a house plant on account of this fragrance. The dried rind when candied is the part used by the housewife. In the United States the citron is grown in both Florida and California.

Besides the true citron there is a small round solid and almost flavorless watermelon that goes by the name of "citron." It grows in temperate regions and is used for making preserves.

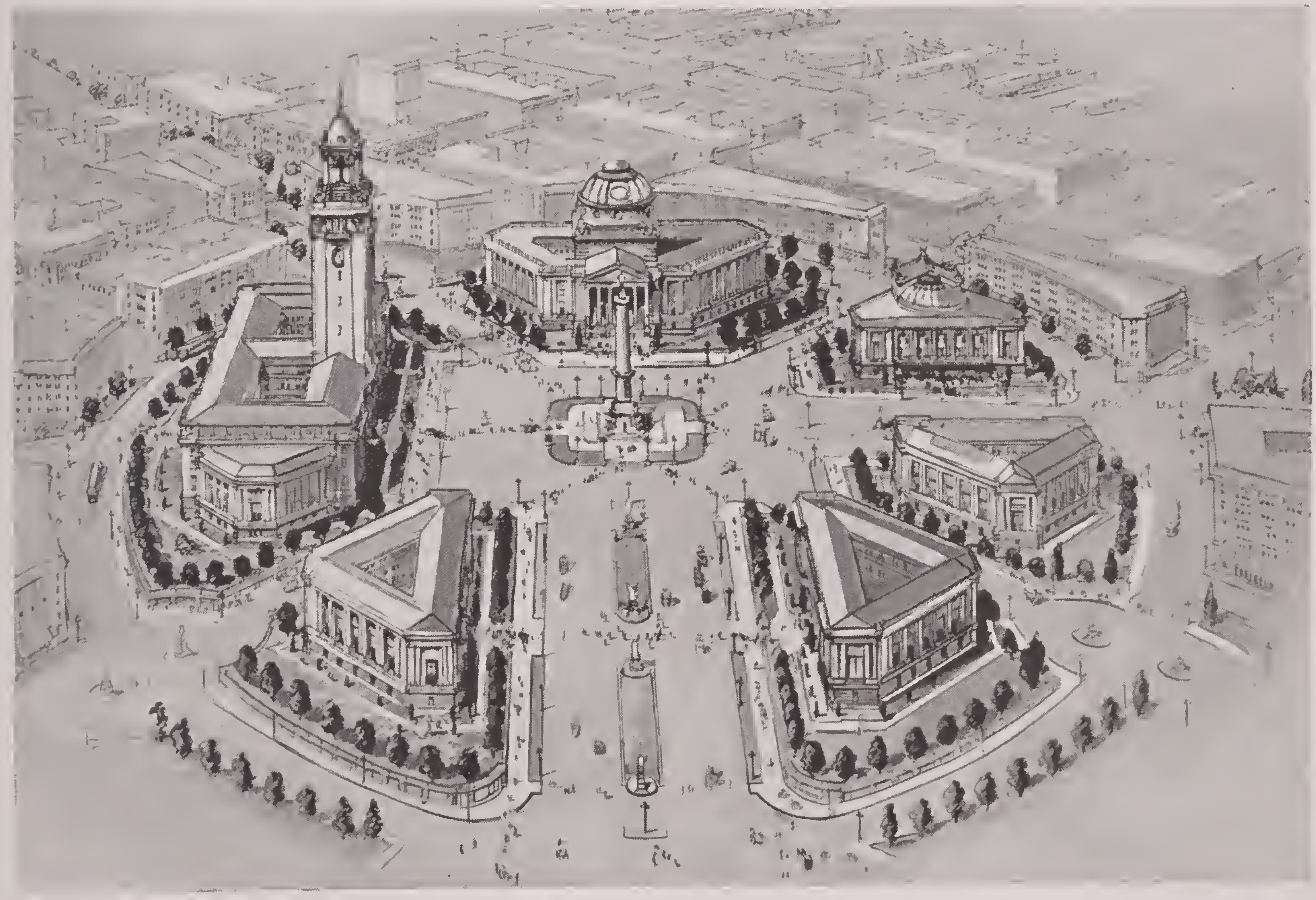
CITY. "God the first garden made, and the first city Cain," said a famous poet. But though the poet may have little love for the crowded life of cities, with their noise, their smoke, their dirt, their intense competition, and their many other evils, the student of history recognizes that city life is one of the most important factors in the growth of civilization. It was not until men exchanged the wandering life of the shepherd for residence in fixed communities that they had the incentive and leisure for the varied activities that bring about progress.

The City of Today and the City of the Past

But the city of today is very different from the city of ancient times. The city of the Greek world was both city and state in one; it was an independent unit and did not form part of a larger state. Sometimes cities would form a loose federation with other cities for defense, and sometimes a city would extend its power over other cities and rule them as subject communities as did Athens and Sparta. In a similar way, the city-state of Rome gradually conquered the other city-states of ancient Italy, and then built up a vast empire stretching from the British Isles on the west to Mesopotamia on the east.

After the downfall of the Roman Empire and the barbarian invasions, the cities of Europe fell under the sway of dukes, counts, bishops, and other lords, who ruled and exploited them as part of their feudal estates. But the community of interest developed in town life breeds a spirit of independence, which asserted itself in stubborn and unceasing efforts by the townspeople to win a greater measure of freedom. The struggles between the cities and their lords form

WHO SAYS THAT CITIES HAVE NO SOULS?



How can anyone say that a city which carves huge areas out of itself for parks and civic centers does not love the better things of life? The architect who conceived this plan for the city of Seattle's civic center was thinking in terms of a great future. Such enterprises cost many millions of dollars, but are well worth the expense.

one of the most important chapters in the history of medieval Europe, and largely contributed to the break-up of the feudal system. Between the 11th and 13th centuries most of the important towns of Europe won charters granting them privileges of self-government. Some of them achieved almost complete independence; and again for a time city-states, such as Venice, Genoa, and Florence, exercised extensive sway. But with the rise of the new territorial states of modern Europe such cities ultimately dropped into their present position as members of a larger state.

When Most Men Lived in the Country

Until comparatively recent times only a small proportion of the people lived in cities and towns. At the beginning of the 19th century only four per cent of the people of the United States were town dwellers; now the urban and rural populations are nearly equal. The movement to the city is even more marked in some European countries. In Germany, for example, more than 54 per cent of the population is urban, while in England and Wales the proportion rises to 78 per cent. This tremendous influx from the country to the city in the last hundred years is due partly to the rise of factory industry, which builds up large centers where facilities are greatest; partly to the improvement of transportation, which makes it possible to bring in the enormous supplies of food required by a great city; and partly to the improvements in agricultural methods and the use of labor-saving machinery on the farms, which render unnecessary the labor of as many farm workers as a century or so ago.

Rise of Our Giant Cities

The result has been the growth of scores of giant cities and many thousands of smaller cities and towns throughout the civilized world—cities far greater than the ancient world ever dreamed of, and of a very different type. No walls surround these giant monsters, as in the city-states of Greece or the communes of medieval Europe. Instead they reach out like great octopuses far into the surrounding countryside, every year bringing more and more of the green fields and meadows into their clutch. From every direction comes an endless stream of trains and trucks bringing food and other supplies for the city's toiling millions. Factories and locomotives belch forth clouds of smoke that settles over the city like a pall, sometimes blotting out the light of the sun at noonday. Clashing street-car gongs, automobile "hooters," and factory whistles fill the air with their din. Traffic piles up at the intersections of the crowded thoroughfares in seemingly inextricable confusion. The rich make their homes in pleasant districts of the city or in residential suburbs, far from the noise and dirt of the industrial sections, while the poor are too often crowded together in ugly and insanitary slums.

The modern city, therefore, has brought with it many problems of government and administration—how to make the city a pleasant and healthful place to live in, how to reduce crime and vice, how to check disease, and a score of others. The government of a city like New York or Chicago is a more formidable and complicated task than the government of many a European nation. The sort of administration that was adequate for a city of a century ago is helpless before the difficulties of managing a huge metropolis of today, and various new systems are used to meet the new difficulties (*see* Municipal Government).

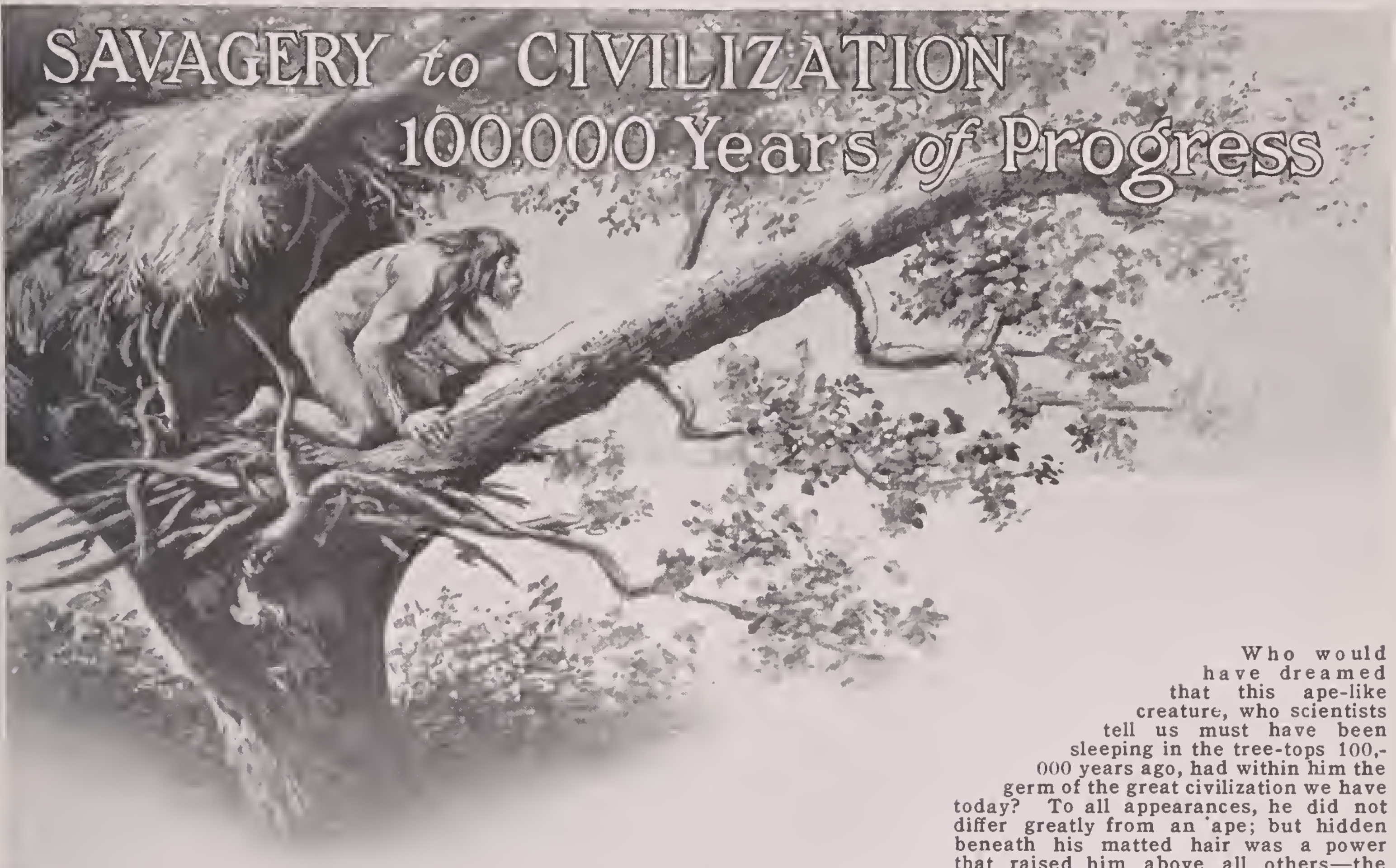
In their efforts to improve their government and provide for the welfare of their citizens, many large cities in the United States have found themselves hampered by the extensive authority over municipal affairs which is retained by the legislatures of many of the states. In many cases legislatures have withheld from cities powers which they needed for their proper development and have unjustifiably interfered with the local affairs of cities. A powerful "home rule" movement has therefore grown up, to give cities complete control of their affairs even to framing their own charters, subject to state legislative approval.

The "Designing" of Cities

The direction in which the most effective work has been done for the development and improvement of the modern city is in city planning. The purpose of this movement is to design a city as an architect designs a house, so as to afford the greatest possible amount of health, beauty, and convenience. Most great cities have grown up as chance directed; only a few, such as Washington, D.C., Detroit, Buffalo, and Canberra, the new capital of Australia, have been created according to a preconceived design. Hence the work of the city plan commission is for the most part to correct the errors of the past—to widen streets and cut new ones where they are needed, to provide beautiful and convenient places for great public buildings and to see that they form a harmonious whole instead of a hit-or-miss jumble, to regulate the height of buildings, to develop a system of boulevards, parks, playgrounds, and bathing beaches, to see that homes are constructed with proper regard for sunshine and fresh air. In its broadest sense, city planning includes even such matters as the provision of proper transit facilities, eliminating grade crossings, expanding the lighting, sewerage, and water systems to meet the needs of the growing city, and the establishment of municipal markets. Another important phase, which is receiving increased attention, is "city zoning," that is, marking out certain areas which are to be used solely for certain designated purposes, such as residence, business, light industries, and heavy industries.

The city planning movement in North America is for the most part an outgrowth of the Chicago World's Columbian Exposition of 1893. The well ordered grouping of buildings under the direction of Daniel H. Burnham inspired an immediate desire to apply the same principles to the designing of cities. Hundreds of cities in the United States and Canada have adopted systems of city planning and the leading European countries show many examples.

SAVAGERY *to* CIVILIZATION
100,000 Years *of* Progress



Who would have dreamed that this ape-like creature, who scientists tell us must have been sleeping in the tree-tops 100,000 years ago, had within him the germ of the great civilization we have today? To all appearances, he did not differ greatly from an ape; but hidden beneath his matted hair was a power that raised him above all others—the power to reason. The story of the marvelous development achieved by human reason is told in text and pictures on the following pages.

CIVILIZATION. A hundred thousand years ago, so scientists say, primitive man wandered through tropical forests picking up nuts and fruit for food. He wore no clothes and had no tools or weapons, and at night he climbed a tree for security while he slept. The only thing that distinguished him from the large apes was his ability to speak a rough sort of language. This was the Earliest Period of Savagery.

Then came the first great step in civilization. He discovered the use of fire. This wonderful discovery enabled him to leave the treetops, for wild beasts were frightened by his flaming brands. From being hunted he became the hunter, for he could now cook meat and fish for his food. He learned to throw stones and make clubs and rough stone spears for his hunting. He could even leave the tropical forests and keep himself warm by means of rude skin garments in a more vigorous and inspiring climate. This was the Second Period of Savagery.

But while man was away from his fireside hunting the smaller animals, he was still at the mercy of the larger ones Spears and clubs were poor weapons against saber-toothed tigers, cave bears, mammoths, and wild bulls. But some savage genius invented the bow and arrow, and another great advance was made.

With the bow and arrow man was soon able to kill the larger game animals and to drive off his fiercest enemies, for he could strike the swiftest creature at a distance. For the first time he was sure of plenty of food. This left him some leisure for the arts of life. Men began drawing pictures on the walls of their caves, and the savage women learned to scrape and cure skins until they were soft and sew them with bone needles into more serviceable garments. The hides of the larger animals were made into tents, and man found he could travel considerable distances with some safety and comfort. So knowledge spread and weapons improved as the hunters picked up new tricks and devices in their travels. This was the Third Period of Savagery, and it had taken man perhaps 80,000 years to develop to this stage of progress.

How the New Pots Helped Along

Now came the great discovery which enabled man to cross the gap between Savagery and what we call Barbarism. He learned to make pottery. Up to this time there had been no cooking vessels which could withstand the heat of fire. Meats and such few vegetables as the savages could use were roasted, or at best scalded by dropping heated stones into water held in the hollow of a skin. But with pottery came the means of boiling food. This added many new products to man's bill of fare, and the simmering pot became the center of the community life. Men learned to build wooden and stone huts and settle down in small villages. Social life began on a permanent scale. Barbarian housewives could gossip about new ways of flavoring stews, while the men discussed the merits of the latest barbed fish-spear. To make themselves perfectly safe from attack, many of these early barbarian clans built their houses on wooden piles set in lakes and connected with the shore by removable wooden gangways. Log canoes were also constructed as a result of this life over the water.

MAN'S FIRST GREAT ACHIEVEMENT

One of the first upward steps was learning to chip stones into tools and weapons. This gave man his first great advantage over beasts. Before that he had the beginnings of speech; also fire, but for the renewal of the latter in case of need he was dependent upon chance trees set ablaze by the lightning. Tools, weapons, and fire placed man definitely above the brutes.

While men continued to hunt and fish, the women soon made another important discovery. For thousands of years they had been gathering the seeds of wild grasses and storing them in baskets and jars to be crushed later between stones and baked into rude cakes. They now learned that by planting these seeds in the ground they could grow the grain-producing grasses right at their doors. So agriculture began, and crops of wheat, barley, and millet were yearly reaped. These fields bound the barbarians more permanently to their homes, for they had to remain at least a year in one place to gather the crops they sowed.

THE NEXT GREAT STEP—MAKING FIRE AT WILL

Man's next triumph was learning to make fire whenever he wanted it, by striking sparks from stones, rubbing together pieces of dry wood, or twirling a stick against a block. Fire preserved man from cold in winter, scared away beasts at night, and enabled him to prepare more nourishing food. It also gave him social evenings by the fireside, stimulating his powers of speech and reflection.

At this point another great discovery came, which marked the beginning of the Second Period of Barbarism. Men found that wild animals could be tamed. Probably this idea came by accident when a hunter brought home some young animal for his children to play with Doubtless the dog was the first domestic creature, but the sheep, the goat, the cow, the camel, and the horse slowly followed. Herds of cattle grew up around the houses and fields, and men no longer depended on hunting for their meat. Beasts of burden were trained to pull the primitive plows and carry loads of firewood or haul logs for house-building.

With domestic animals came the first great social break between the members of mankind. As the numbers of cattle and sheep grew too large for the home barnyard, the young men were sent out to herd them on distant pasture lands. This was a carefree adventurous life, and many refused to return to work in the fields of their native homes. They married and took their wives to live with them in their tents. Their herds furnished them with milk and meat, so they could wander at will over plains and mountains, setting up their homes where the grass was good, then moving on to new pastures. The less venturesome remained in the farming villages, and thus grew up two very different sets of peoples, the *nomad herdsmen* of the plains and deserts, some of whom soon learned to ride horseback, and the *agricultural tribes*, who eventually began to build cities.

With one set of people raising live stock and the other growing crops and manufacturing cloth, as they had learned to do, and making pottery and ornaments, trade naturally arose. There was no money yet, but sheep and cattle were exchanged for grain, vegetables, etc., and the world's commerce began. With commerce came quarrels between the wild herdsmen and the agriculturists. Men rushed to arms, and thus we see the beginnings of systematic warfare.

In the midst of these tribal conflicts came the discovery of the use of metals—first copper, then bronze made of a mixture of copper and tin, then iron. With the discovery of iron, man reached the Third (and highest) Period of Barbarism.

THEN POTTERY—AND AN END TO SAVAGERY!

Finally, after thousands of years of slow evolution, man discovered how to make vessels of baked clay. He could now boil meat and vegetables, thus greatly extending his diet and putting one step further away the menace of starvation which always loomed threateningly before him. With this discovery he passed from Savagery to Barbarism.

Iron enabled the agricultural tribes to construct towns on a larger scale, protecting them with walls of brick or stone. Carts could be manufactured in greater numbers, and with carts and chariots came road building. The peoples who had the most iron and other metal weapons were able to conquer and make slaves of weaker tribes. In the centers of population and trade wealth accumulated and luxuries multiplied. Artists carved stone monuments, picturing the deeds of the tribal gods and kings.

AND NOW BEGINS MAN'S RAPID PROGRESS

Like a workman who can push a task forward rapidly, if he only has good tools, man now moved onward in greater strides. Bows and arrows enabled him to bring down game in plenty. He learned to tame animals, the dog for hunting and others for their food and hides; and logs hollowed into boats gave him mastery over the water.

Man Learns to Write

Meanwhile there was slowly developing the greatest invention of all—the one that did more to uplift the human race than any other achievement in man's career. This was the invention of writing, which enabled man to preserve his knowledge and hand it on to others in distant times and places. (*See* Writing.) With writing came the Historical Period. The age of Barbarism closed, and the advanced races of mankind started up the great ladder of real Civilization.

AGRICULTURE AND BETTER DWELLINGS SOON FOLLOW

Planted farms, herds, and dwellings put an end to animal-like wanderings. Man settled down; sons inherited what their fathers made, and could use the time thus saved for making still further developments. A hundred years now saw progress that formerly had required a thousand.

The importance of the invention of writing is shown by the speed of man's progress after he learned to write. It had taken him perhaps 90,000 years to travel from the lowest stage of Savagery to the highest stage of Barbarism. But with the art of writing to help him, he leaped rapidly forward, and in about 5,000 years has reached the advanced civilization we see about us today.

CITIES NEXT—REAL CIVILIZATION BEGINS

Ox-carts and larger boats started cities, with records and written laws, for food could be brought from a distance to feed the city dwellers. City people made implements for the farmer, and so left him more time for farming. In this way labor was divided up and each man could do the thing he was best fitted to do.

His first progress, however, did not seem so rapid, at least in a material way. There were great advances in human knowledge, but for many centuries no great inventions upset the world. For practical conveniences, the common people of Europe were little better off 150 years ago than those of ancient Egypt.

But toward the close of the Middle Ages there had appeared in quick succession three great inventions and one great scientific discovery, which helped to change the entire aspect of European civilization. The inventions were gunpowder, the sailor's compass, and the printing press, and the discovery was the proof that the earth moves around the sun, and not the sun around the earth.

Gunpowder revolutionized war. Kings were able to destroy the castles of rebel princes and bring them all under one organized government. The noble knight in armor became a less valuable soldier than the footman with a musket. Thus gunpowder first helped to build powerful nations and then put power in the hands of the common people.

The compass gave men a guide across the unknown waters of the earth. Sea trade could be undertaken on a broader scale, and explorers discovered the vast riches of new lands.

The printing press rapidly provided mankind with a large number of books at low prices. The great store of knowledge accumulated by scholars for centuries was set free to educate the world. Magazines and newspapers became possible, and men were able to learn what was going on and take an active interest in the politics, science, and literature of their day.

The discovery of the true relation between the sun, the earth, and the other planets gave a new and solid foundation for all branches of scientific investigation.

Last of All, the Age of Machinery

Then, about 400 years after these great changes, came an invention which was to produce the quickest and most fundamental upheaval in men's habits and customs. This was the steam engine. With the use of steam came the age of machinery. Inside of 150 years the world has been turned topsy-turvy. Continents have been covered with a network of railways, and the waters of the earth throng with gigantic craft, propelled without sail or oars. Over land and under the seas stretch wires along which messages course with the speed of lightning. Inventions and discoveries pile upon each other so rapidly that no man can keep track of them. In our homes, on the farms, in factories, and even in our amusements machines are everywhere, working for us with a power equal to that of many billions of slaves.

GATHERING THE FRUITS OF ORGANIZATION

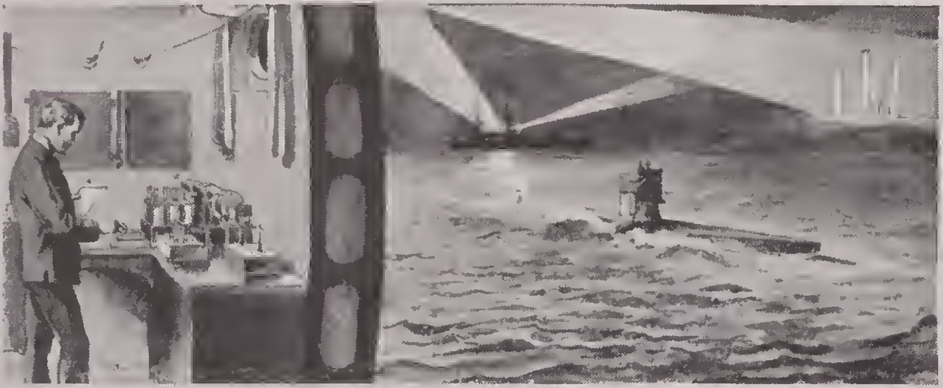
In Egypt the partnership of city and farmer proved so valuable that the bare necessities of life could be produced with much less time and effort. This left man time to develop art and architecture. The ancient Egyptians, the Babylonians and Assyrians, and after them the Greeks and Romans, used this leisure to build magnificent public structures, to provide support for artists, thinkers, and teachers; and thus culture took giant strides.

THE CIVILIZING FORCE OF MACHINERY

After several centuries devoted to the development of science and invention came one of the greatest of all civilizing agents—the Steam Engine. Thanks largely to it, the human race makes the earth support twice the number of people it did a hundred years ago, with greater comfort for everyone.

It is in the midst of this last great swing of civilization, based on scientific knowledge and invention, that we are living today. The steps which have brought man from the lowest Savagery through the various stages of Barbarism to this height of Civilization have been infinite in number and have covered many thousands of years. Yet in one aspect they can be grouped around these few practical inventions or discoveries, each of which, simple as it may seem to us, caused a profound change in man's habits of living and opened up great new paths of progress.

AND OUR LATEST TRIUMPH—ELECTRICITY



The story of man's progress is brought down to the present day with his latest conquest—the mastery over electricity. Electric lights, trolley cars, the telegraph, the telephone, the ocean cable, the wireless, and countless other marvels are made possible by it. It is the Twentieth Century magic.

But Civilization in the higher sense means more than inventions and discoveries. It means more than mere improvements in food, clothes, houses, methods of communication, and the like. It means the growth of better governments and more reasonable law, so that men may live and work in peace and safety. Even more, it means the cultivation and uplifting of men's minds and spirits, through science, art, literature, and religion. This too has come to us; for the inventions and discoveries we have mentioned have helped man also, directly or indirectly, to develop his intelligence, his sense of justice and moral obligations, as well as to establish more firmly his mastery over the forces of nature. (*See* Cave Dwellers; Factory and Factory Laws; Stone Age.)

CIVIL SERVICE. The term "civil service" in its widest sense includes all branches of the executive government, except the military and naval services. It does not include members of the legislative branch of the government and the judges; nor, in popular use, are elective officers or the higher appointive officers of a political character included. It does take in, however, the great mass of officials who carry on the government's work. Thus, the United States civil service numbers its hundreds of thou-

THE TRAIN OF CIVILIZATION SPEEDS ON!

Man took perhaps 1,000 centuries to travel the track of Civilization which led to the Pyramids. Then, with the elements of Civilization mastered, the Train of Progress spent nearly 5,000 years in traveling from that stage to the present. Where will the great train carry us next? Will man centuries from now look back on a path of progress as startling as that we have just reviewed? Who can tell?

sands of employees ranging from mere clerks to the highly trained expert. On Uncle Sam's pay-roll are watchmen, typists, librarians, bookkeepers, accountants, statisticians, printers, patent examiners, postmasters, revenue collectors, teachers, matrons, seamstresses, physicians and nurses, civil, mechanical, and electrical engineers, technical and scientific experts. This is only a partial list of the many classes of employees for the departmental service at Washington, the postal service, customs service, Indian service, and all the different branches of government work in the United States, and in the Panama Canal zone, Alaska, Hawaii, and the Philippines. State and municipal governments also have their civil services, often numbering thousands of persons.

Intense rivalry between political parties, early in the 19th century, developed what is called the "spoils system," under which the positions and salaries in the public service were distributed as political "plums" among members of the party in power, without regard either to the appointee's ability or trustworthiness. To check such abuse of the appointive power, which destroys the efficiency of government, both England and the United States adopted "civil service reform," based on the "merit system." This provides that civil service positions, as a rule, shall be given to applicants who have passed suitable examinations or other tests for such positions. In the United States the Civil Service Commission was established in 1883, to give examinations for different classes of civil service positions, and to watch over the enforcement of the civil service reform laws. (For information as to examinations, etc., write to the Civil Service Commission, Washington, D. C.)

The WAR *that* PRESERVED *the* UNION *and* FREED *the* SLAVES

The "Blue"

FOR half a century the history of the United States is a troubled prelude to the bloody conflict which we know variously as the "Civil War" or the "War of Secession." Then for four long years, amid alternate gloom of defeat and exultation of victory—now for the North, now for the South—the fratricidal conflict continued, until its close with the surrender of Lee and the tragic assassination of Lincoln. But the Union was preserved and the Slave set free. After that followed the long and troubled period of Reconstruction, in which the South ate the bitter bread of defeat and humiliation, and the base passions which are always an accompaniment of war worked their will in North and South alike.

The "Gray"

CIVIL WAR AND RECONSTRUCTION. At 3:20 on the morning of April 12, 1861, a small boat glided over the waters of Charleston Harbor to Fort Sumter, bearing a messenger with this note from the Confederate General Beauregard to Major Anderson, of the United States Army, commander of the fort: "I shall open fire on Fort Sumter in an hour." The hour passed. The guns on shore belched forth smoke and flame. The Civil War, which was to last four years, had begun!

Slavery Only One Cause of the War

But though the Civil War began with the first shot fired at Fort Sumter, we must go back many years to find the causes which led up to the bitter struggle. Mere sectional jealousy had much to do with it. In those days railroads did not unite so closely with their iron bonds the widely separated parts of the country. New Orleans was as many days' travel from New York as New York is now from London or Paris. The business interests of North and South differed greatly also. The South raised cotton, which she sent to England and in return received furniture, clothes, and machinery. But the North had begun the manufacture of these things, and wished tariff laws which would protect their "infant industries" and force the people of the country to buy products "made in America." And while the South clung to "states' rights" and a narrow construction of the Federal Constitution, the North and West became more national in their point of view and favored a broad construction of that document as regards the powers of Congress to deal with banking, internal improvements, and a host of similar subjects affecting the economic life of the United States as a whole.

Back of these sectional jealousies and conflict of interests lay the one great question of slavery. For years this "peculiar institution" of the South had caused quarrels and bickerings between the sections. The people of the North since the formation of the Union had come more and more to look upon slavery as a moral wrong. In the same period the South

THE MONITOR 'MONTAUK' DESTROYS THE 'NASHVILLE'

In 1861 the Confederate privateer *Nashville* escaped from Charleston and made its way to England, returning the following year, this time running the blockade into Beaufort harbor. The stories of its exploits put the Union navy on the alert. In March 1863 the *Nashville* was caught in the Ogeechee River by Federal ironclads. The monitor *Montauk* led in the attack. The *Nashville* ran aground, but kept up a heavy fire until flames broke out on board and the magazine exploded.

had changed from the view that slavery was a "necessary evil" connected with raising cotton, to one in which slavery was regarded as a "positive good" and the negro as better off under slavery than as a free man. Forty years before the first state seceded, the people—North and South—had thought the slavery question was peaceably settled forever by the Missouri Compromise. But it came up again and again, and the Compromise of 1850, the Kansas-Nebraska Act, and the Dred Scott Decision were other attempts to find a peaceful agreement. All these had failed, and in 1860 the time had passed for compromise. Although it was the existence of slavery in the Southern States that made the war inevitable, it is a mistake to look upon that great conflict in the beginning as an organized effort to free the negro by the sword. It started over the question of secession: Could a state leave the Union when it pleased?

As soon as it was known that Lincoln, the Republican candidate, had been elected president, the governor of South Carolina called a state "convention" which declared (Dec. 20, 1860) that "the Union now subsisting between South Carolina and other States, under the name of the United States of America, is hereby dissolved." Other Southern states followed the example of South Carolina, and in February 1861, the government of the Confederate States of America was formed. (*See* Confederate States of America.) The Confederacy took possession of such of the forts, shipyards, and arsenals of the United States in the South as they could master, on the ground that no foreign country could hold property within its boundaries.

This action distressed the irresolute president, James Buchanan. He loved the Union and hated to see it broken up. He thought that the South had no right to secede, but he felt that he could not use force against a state to compel it to remain a part of the Union. All sorts of advice was given to him in this emergency. Some urged him to "let the erring sisters go in peace." Others wanted him to preserve the Union at all costs. Even his cabinet was divided. Many government officials and officers in the army resigned their positions because they felt that their first duty was to their state rather than to the nation.

In January 1861 Buchanan tried, in a half-hearted way, to send food to the little handful of men in Fort Sumter; but when the people of Charleston refused to allow the vessel to land he weakly submitted. When Lincoln became president, he decided to send aid to Major Anderson. As soon as this decision was known in Charleston, the secessionists demanded the surrender of the fort, and when this was refused they began its bombardment.

Forming the Union Army

If there was to be a war Lincoln wanted the responsibility of starting it to rest with the South. The firing upon the flag gave the North this advantage. Within 48 hours after Lincoln's call for 75,000 men had flashed over the wires, thousands of enthusiastic citizen soldiers had enlisted. From farmers, miners, mechanics, and clerks behind the counter they became soldiers of the republic. The officers at times knew as little of war as the men. The story is told of a colonel at the head of his regiment who, coming to a pool of water in the road, and not knowing the proper word of command to avoid it, shouted, "Gee round that hole!" His men understood and obeyed the command. Out of such resourceful material the armies of the Union were made.

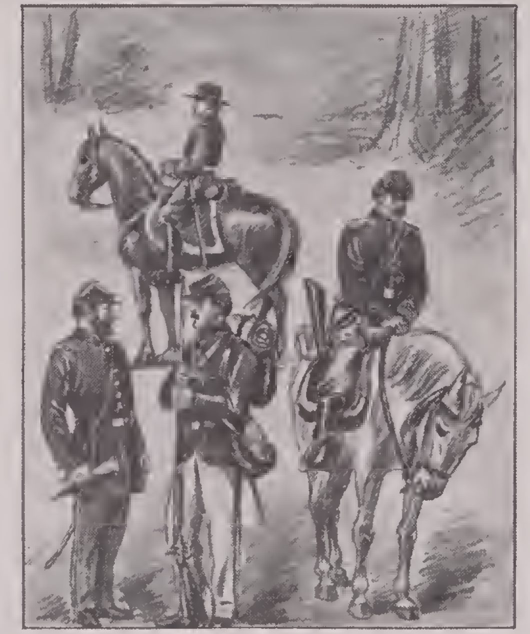
Initial Successes of the South

At the beginning of the struggle the Southerners looked with contempt on these armies of the North. They proudly boasted that "one healthy Southerner could lick five Yankees." And the confidence at first was justified. The men from the South were accustomed to an outdoor life. While many of the Northern soldiers had never fired a gun before in their lives, the Southerners all knew how to ride and how to shoot, for hunting was one of the favorite amusements of the South.

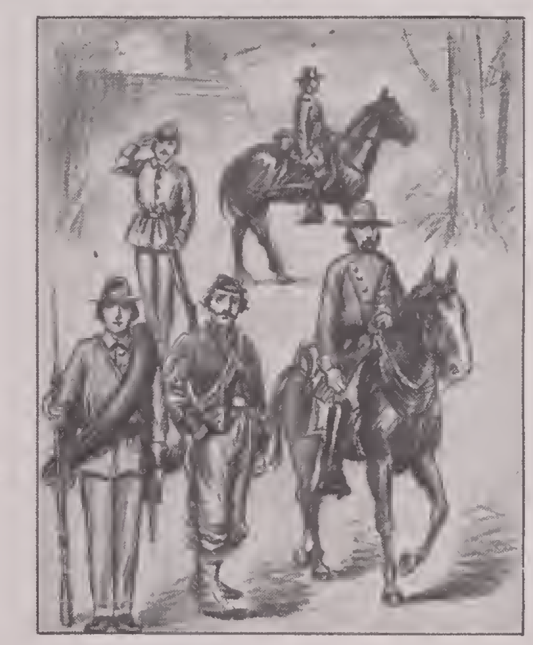
The South, too, had the advantage of being more united in sentiment than was the North. But she lacked the iron foundries, the munitions factories, the money, and the food supply of her enemy. She counted on securing all of these necessities from England in return for her cotton. And her ranks were solidified; for, after the firing on Fort Sumter, the states of Virginia, Arkansas, North Carolina, and Tennessee had joined the South, and Richmond became the capital.

The South was more sure than ever of its victory after the battle of Bull Run (July 21, 1861). In this first battle of the Civil War the Confederates defeated the Union troops and drove them back in confusion to Washington. One Confederate wrote in his diary: "Everyone believes that our banners will wave in the streets of Washington in a few days." Richmond was gay with flags the day after the victory, and the people expected the border states of Maryland, Kentucky, and Missouri at once to cast in their lots with the new Confederacy.

PICTURED FACTS ABOUT THE CIVIL WAR



The total number of Federal troops enlisted was 2,898,304.



The Confederate army enlistments were between 1,239,000 and 1,400,000.

The first shot of the War was fired at Fort Sumter April 12, 1861.

The people of the North had not dreamed of defeat in that first battle, and their disappointment was bitter. But as the lightning clears the murky air on a sultry day, so the defeat cleared the political atmosphere of the North. All saw that the war was to be a conflict to the bitter end. Their determination was expressed by an old clergyman at an Illinois camp-meeting, who, when the news came of Bull Run, announced, "Brethren, it is time to adjourn this meeting and go home and drill."

How the North Finally Won

All over the North new armies were built, and the leaders at Washington planned four separate campaigns. If they could carry out these four plans they felt that they would win the war. They must capture Richmond, the Confederate capital; they must keep all ships from entering or leaving Confederate harbors and so cut the South off from foreign aid; they must gradually reconquer the seceded territory by pushing back the rebel lines in Tennessee; and they must capture all the towns on the Mississippi River and cut off Louisiana, Arkansas, and Texas from the rest of the South.

For the North the history of the Civil War is the story of the attempt to carry out these plans. For the South the war was largely a matter of defending their territory and of holding out in hopes that the North would tire of the struggle or that help would come from abroad.

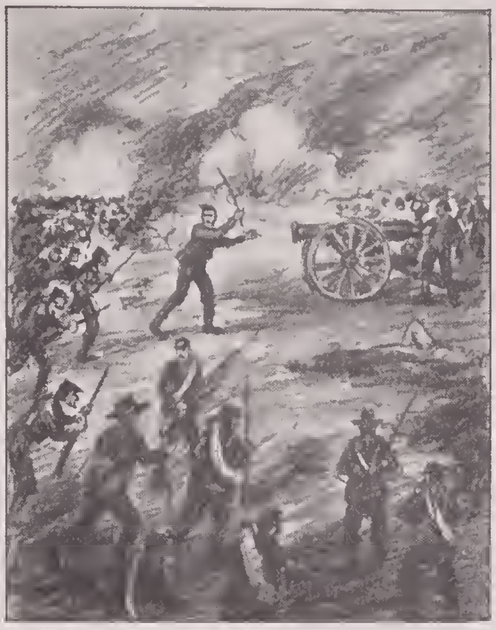
We cannot here tell in detail how the plans of the North were carried out, though it took four years to do it. In the terrible Seven Days' Battle of the Peninsular campaign, Gen. George B. McClellan, after getting within a few miles of Richmond, was defeated and driven back (June 25–July 1, 1862). The bloody battle of Antietam (Sept. 17, 1862), in which Gen. Robert E. Lee was defeated in Maryland, gave Lincoln the occasion to issue his first Emancipation Proclamation (Sept. 22). The Southern joy over their victory at Chancellorsville, Va. (May 2–4, 1863), was tempered by grief over the loss of their beloved general, Stonewall Jackson. The defeat of Lee in the three-days' battle at Gettysburg (July 1–3, 1863) definitely marked the turning of the tide and forecast the ultimate defeat of the Southern cause. The North went wild over the news of this victory. For days the people had been panic-stricken by the Confederate invasion of Pennsylvania, and the relief was correspondingly great.

Only one man seemed to see that the Union commander, Gen. George G. Meade, had not gained as much as he might. This man was President Lincoln. During those terrible days and nights of the Gettysburg battle he had haunted the War Office and devoured every scrap of news as it came in over the telegraph wires. He hoped for, and expected, substantial fruits from this dearly bought victory. When General Meade's telegram came announcing that he was "driving the invaders from our soil," an expression of disappointment came over his face. His hands dropped to his knees and in tones of anguish he exclaimed: "Drive the invaders from our soil! My God! is that all?" He had expected Meade to capture Lee and so end the war, but two more years of hard fighting in the East were necessary before that was done. The bloody battle of the Wilderness (May 5-12, 1864); the conflict at Spottsylvania Court House, after which Grant sent his famous message, "I propose to fight it out on this line if it takes all summer" (May 12–21); the battles of Cold Harbor (June 3), and Cedar Creek; and Sheridan's devastating raid in the beautiful Shenandoah Valley in September—all these were necessary before Lee, on April 9, 1865, was brought to surrender his army to Grant at Appomattox Court House.

And before that day was come, each of the other plans of the Federal government had been successfully carried out. General Grant had proved his worth in the west by the capture of Forts Henry and Donelson (February 1862), and by the battles of Shiloh or Pittsburg Landing on the Tennessee River (April 1862); and finally by the capture of Vicksburg (July 4, 1863), he freed the Father of Waters so that it might once more "roll unvexed to the sea." After the "great battle of the West" around Chattanooga (Nov. 24–25, 1863), Grant was called to the East, and Sherman was left in the West to begin his famous march "from Atlanta to the sea" (December 1864).

Meantime the struggle on the sea was proving equally successful. After the spectacular defeat of the iron-clad *Merrimac* by the *Monitor* (March 9, 1862) there was no chance for the South to break the blockade maintained by the Federal navy. Gradually, too, all hope of aid from England and France faded away.

PICTURED FACTS ABOUT THE CIVIL WAR



There were 2,400 battles of sufficient importance to be identified by name.

The total number of casualties in the Union army was 359,528.

The casualties in the Confederate army numbered about 258,000.

Grant and Sherman Bring Victory

But in spite of the defeats and discouragements, the South was more hopeful of victory than were many in the North. While Grant and Meade were winning the victories of Vicksburg and Gettysburg, faint-hearted or disloyal men in Northern cities were holding mammoth mass meetings urging the government to make peace with the South. Refusals to enlist in the army obliged Congress to pass a "draft" law for compulsory military service. For several days in July 1863, a mob ruled New York City and prevented the enforcement of the draft. Despite these difficulties the North, with far less effort than the South, kept a half more men in the field, though it has been estimated that of her military population one man out of two bore arms, while of that of the South, nine men out of ten were under arms.

Sherman's devastating march through the heart of the Confederacy revealed to the world the exhaustion of the South. Food was scarce, her money worthless, many of her homes in ruins, and her population so reduced that she could not replace the men who had fallen in battle. The Confederate government was forced to flee from Richmond (April 2, 1865). Its armies surrendered, the war was over, and the Union was saved.

Troublous Times of Reconstruction

There were still many difficult problems growing out of the war to be solved. The thousands of men in the armies, both North and South, must be returned to civil life; the Southern States must be restored to their former relations with their sister states of the North; the freeing of the slaves, which had begun with the Emancipation Proclamation, must be completed; and the 6,000,000 negroes who were to enjoy a freedom to which they were entirely unaccustomed must be protected and provided for.

These difficult problems of "reconstruction" were made harder by the fact that just at the close of the war, while the North was still rejoicing over the capture of Richmond, President Lincoln was assassinated by John Wilkes Booth, an actor of fanatical Southern views (April 14, 1865). Lincoln had held a lenient view concerning the seceded states. A state, he said, could not leave the Union. The individuals of the South had, according to the Constitution, committed treason, but the president by his pardoning power had the right to pardon that. And by his amnesty proclamation of 1863, Lincoln had offered pardon to all, except certain prominent leaders of the South, who would lay down their arms and take an oath to support the Constitution. The representatives of a state, he declared, might take their place in Congress when the state ceased fighting and one-tenth of its voters organized a loyal government.

President Johnson, who succeeded Lincoln, accepted much the same view of reconstruction as Lincoln had held, and by the autumn of 1865 every Southern State except Texas was reorganized under this plan. They had also ratified the Thirteenth Amendment to the Constitution, which forbade slavery in the United States.

But Congress did not approve of such lenient methods, and refused to recognize the Southern States when their representatives appeared to take their seats in the Capitol. Some congressmen held that the Southern States had by secession committed "state suicide," and so were in the position of territories, subject to the will and control of Congress. Others held the more extreme view that they were "conquered provinces," in which the people had not even civil rights. This divergence in views led to a long and bitter struggle between President Johnson and the Republican majority in Congress (*see* Johnson, Andrew). In the end Congress won, and its harsh policy of reconstruction added to the bitterness of feeling left by the war.

Under the Congressional plan the Southern States must accept also the Fourteenth Amendment, which gave the negro civil rights and which made many leading Southerners ineligible for political office. The liberated slaves were placed under the protection of the Freedmen's Bureau, which the blacks expected would give them the "forty acres and a mule" promised by unscrupulous politicians.

All of the Southern States except Tennessee refused at first to accept the Fourteenth Amendment, and so, in 1867, Congress by the Reconstruction Act began at the beginning as though the war had just ended. It proclaimed martial law throughout the South, which was divided into five military districts. To escape from martial law the States must be reconstructed according to the Congressional plan. The commander of each district was to have registered as voters all persons, without regard to race or color, who had not taken part in the rebellion. These voters might elect delegates to a convention, which should draw up a new constitution for the State, and after this constitution had been ratified by the voters and approved by Congress the State was readmitted to the Union.

The Reign of the "Carpetbaggers"

As this law disfranchised all the leading white men in the South and gave the ballot to the negro, the constitutions were drafted by ignorant freedmen and by Northern politicians who had emigrated to the South after the war and who were in derision called "carpetbaggers." One by one all the states except four—Texas, Georgia, Virginia, and Mississippi—were reconstructed in this way, under constitutions which continued the rule of the carpetbaggers and former slaves. On these last states a new condition was imposed—they must ratify also the Fifteenth Amendment, which specifically gave the ballot to the negro.

Finally in 1871 the last state was reconstructed. The misrule of the carpetbaggers continued until 1872 when public opinion in the North forced Congress by an amnesty act to give back the ballot to most of the former Confederates. This helped the old leaders to regain control, and the last prop of the carpetbag governments was removed in 1877 when the Federal troops were recalled by President Hayes. The Civil War and the trying period of reconstruction were at last ended, and the Union was restored. But in many respects besides the abolition of slavery the new Union differed widely from the old.

Interesting Facts about the Civil War

The first shot was fired at Fort Sumter, April 12, 1861. The last shot was in the battle of Palmito, Tex., on May 13, 1865.

During the war there were about 2,400 engagements of sufficient importance to be identified by name.

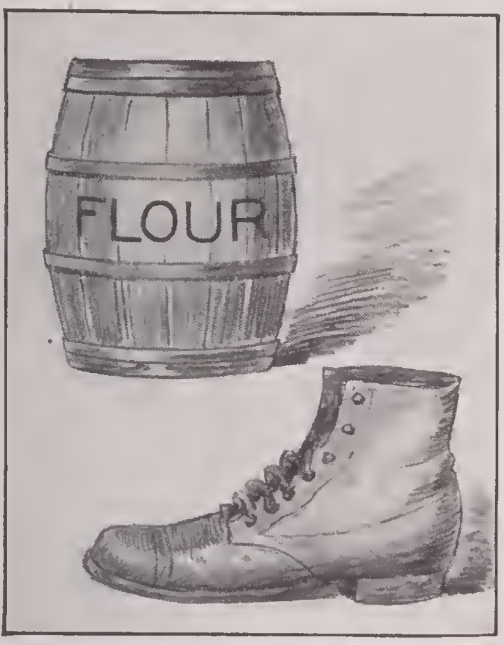
The number of men serving in the Union army for three years or moreaveraged 1,556,678; in the Southern, 1,082,119. The total number of enlistments of Federal troops was 2,898,304. Many Southern records have been lost but it has been estimated that the total Confederate enlistments were between 1,239,000 and 1,400,000.

The total number of casualties in the Union army was 359,528; in the Confederate it was about 258,000. The total number for both sides was about 617,528, or less than one-fiftieth of the number for the World War of 1914–18.

The cost of the war to the Union has been estimated at $3,250,000,000; the cost to the Confederacy at $1,500,000,000; or a total cost of $4,750,000,000 above the ordinary expenses of government in peaceful times.

The war was practically ended with the surrender of General Lee and 26,765 men to General Grant at Appomattox Court House, Va., April 9, 1865.

The most notorious prisons in the South were at Andersonville, Ga., and Libby prison at Richmond, Va., the latter named from the owner of the building. In the North, Camp Morton at Indianapolis and Fort Delaware, Del., were the most notorious. Tales of great suffering and insanitary conditions were told on both sides. After the war Capt. Henry Wirz, commander at Andersonville prison, was tried by the Federal authorities and executed for his cruelty to prisoners and violation of the rules of war.



Owing to paper money inflation, flour in 1864 cost $300 a barrel and shoes $150 a pair.

The United States Sanitary Commission and the Christian Commission carried on relief work for the Northern men similar to that done by the Red Cross, Y.M.C.A., and other agencies in the World War.

Owing in part to the great quantities of paper money issued by both North and South, prices rose to a great height, especially in the South. In 1864 flour was $300 a barrel and shoes $150 a pair. After the war the Confederate currency was entirely worthless.

Blockade-runners, ships built especially for that purpose, carried arms and medical supplies to the South and took away cotton. More secret trade was carried on overland with the North than by blockade-runners.

In the border states the "bushwackers," or Southern sympathizers, and the "jayhawkers" or Unionists, carried on a guerilla or irregular warfare. Jesse James, who later became a notorious train robber, was a member of one of the bushwacker bands in Missouri.

In the winter of 1862–63, the Confederate Gen. John H. Morgan, with about 3,000 men, made the most remarkable cavalry raid in the war from Kentucky into Indiana and Ohio. For about a month he ravaged the southern portions of those states before he was captured. He escaped within a year from the prison at Columbus, Ohio.

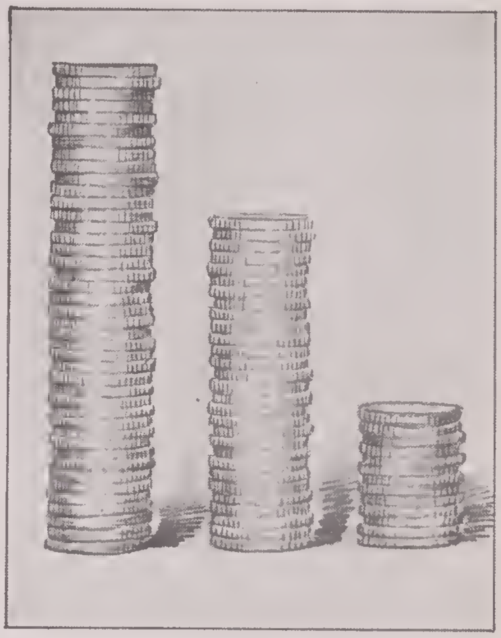
Lee's Surrender to Grant at Appomattox on April 9, 1865, practically ended the War.

The most daring Northern raid was made by 20 men who stole a locomotive from a Southern camp in Georgia, and though they were pursued they ran it about 100 miles in a vain effort to destroy the bridges leading to Chattanooga, Tenn.

In the Northern states bordering on the Ohio River—Illinois, Indiana, Ohio—men who wanted the South to win were organized in a secret society known as the Knights of the Golden Circle. A number of the leaders in Indiana were arrested, tried, and imprisoned for treason.

A former Ohio congressman, Clement L. Vallandigham, was deported into the Southern lines because of his efforts to aid the South.

In England men like John Bright, Richard Cobden, and John Stuart Mill enthusiastically supported the North. Members of the ruling class, like Palmeston and Lord John Russell and Gladstone, sympathized with the South. Napoleon III of France asked England to join with him in recognizing the Confederacy, but this was refused.



Total cost of the War (represented by pile of coins at the left) was $4,750,000,000; Union, $3,250,000,000; Confederacy, $150,000,000.

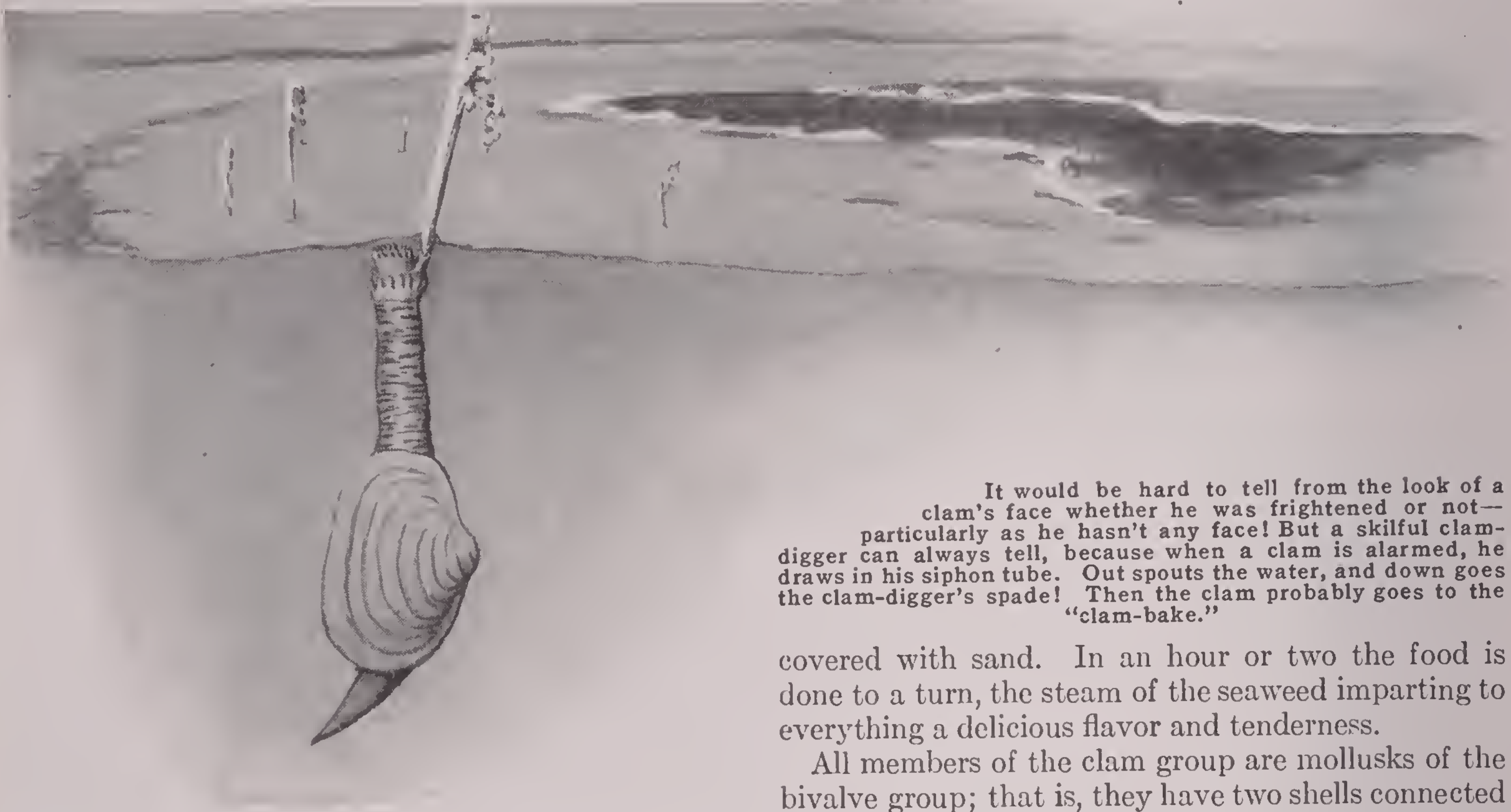
The report of a patriotic act of an aged woman in Fredericksburg, Md., furnished the basis for the poem, 'Barbara Frietchie', by J.G. Whittier.

In the camps the Southern men sang 'Dixie Land' and 'Maryland, My Maryland'. The chief Northern war songs were 'John Brown's Body', 'Battle Cry of Freedom', and 'Marching through Georgia'. The 'Battle Hymn of the Republic' was not written until 1866, a year after the war closed.

During Reconstruction days a secret order called the "Ku Klux Klan" terrorized superstitious negroes and others by midnight raids, in which members of the order wore long white robes, masks, and high cardboard hats. The order was first formed at Pulaski, Tenn., for purely social purposes; but it soon became political and had branches or counterparts in all parts of the former Confederacy. The violence to which the more unruly members resorted led to the "Force Laws" of 1871–72, which declared such organizations illegal. The societies were already on the decline, for the whites had regained control of the government of the Southern States.

For additional information *see* the related articles:

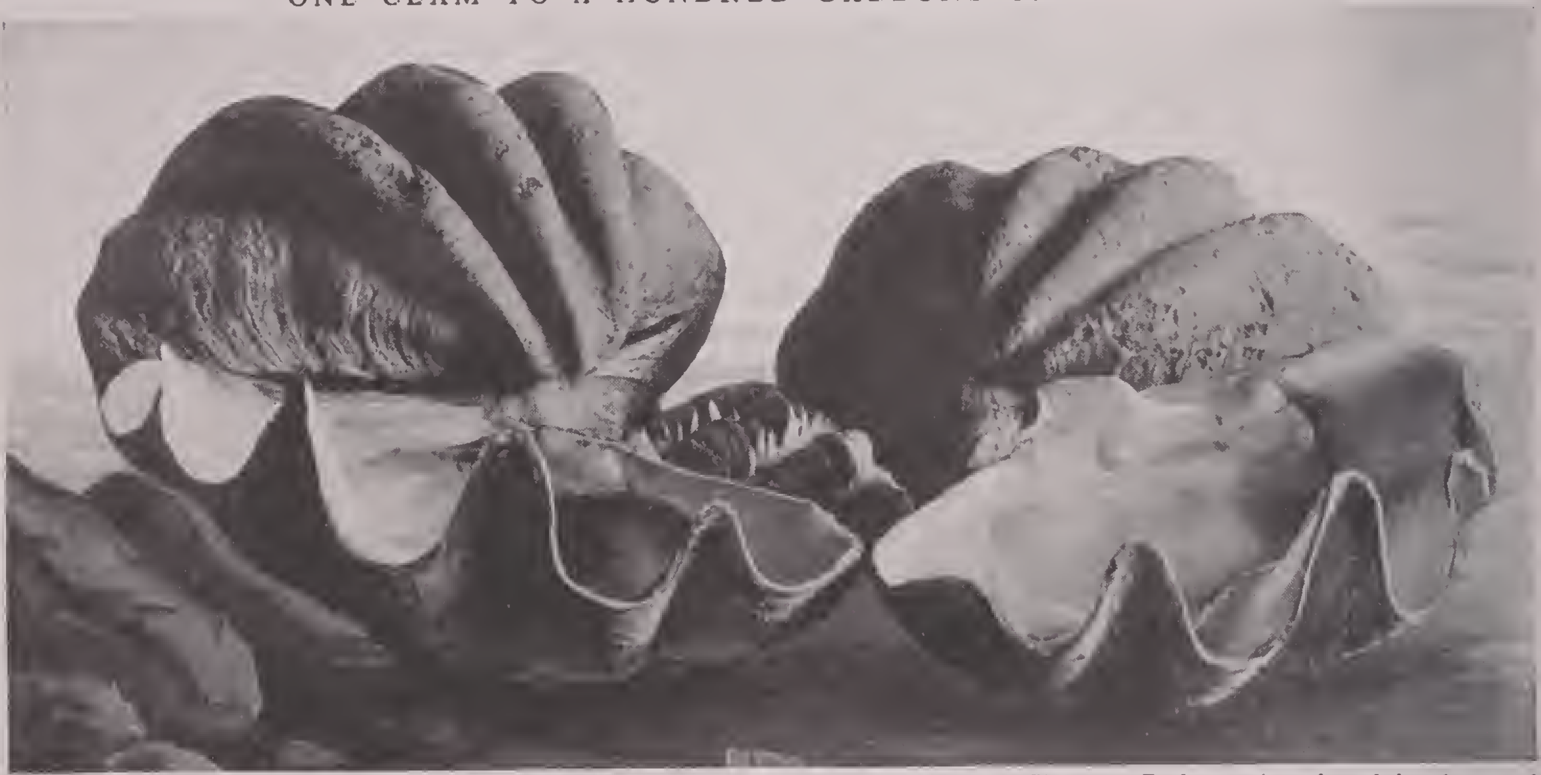
Alabama Claims
Antietam, Battle of
Buchanan, James
Bull Run, Battle of
Chancellorsville, Battle of
Chattanooga, Battle of
Compromise of 1850
Confederate States of America
Davis, Jefferson
Dred Scott Decision
Emancipation Proclamation
Farragut, David
Fort Sumter
Fredericksburg, Battle of
Gettysburg, Battle of
Grant, Ulysses S.
Jackson, Thomas J.
Johnson, Andrew
Kansas-Nebraska Act
Lee, Robert E.
Lincoln, Abraham
McClellan, George B.
Meade, George G.
Missouri Compromise
Monitor and Merrimac
Sheridan, Philip
Sherman, William T.
Shiloh, Battle of
Stanton, Edwin McMasters
States' Rights
Stephens, Alexander H.
Sumner, Charles
Thomas, George Henry
Vicksburg, Battle of



It would be hard to tell from the look of a clam's face whether he was frightened or not—particularly as he hasn't any face! But a skilful clam-digger can always tell, because when a clam is alarmed, he draws in his siphon tube. Out spouts the water, and down goes the clam-digger's spade! Then the clam probably goes to the "clam-bake."

CLAMS AND MUSSELS. When the Pilgrim Fathers landed at Plymouth, the Indians taught them to dig clams in the sand flats, and many a time this lesson kept a Pilgrim family from going hungry. To this day clams can be gathered by the bushel on the Plymouth flats, and in fact along the entire Atlantic coast. The "clam-bake" is one of the most popular forms of picnic in the sea-coast towns of New England. Seeking out some pleasant beach, the members of the party dig their clams at low tide and heat a circle of flat rocks with a huge fire. When this has burned down, the clams are dumped on the sizzling rocks, corn in the ear, dressed chicken wrapped in cloths, lobsters, and potatoes are put on the heap; and the whole is then piled high with damp seaweed and covered with sand. In an hour or two the food is done to a turn, the steam of the seaweed imparting to everything a delicious flavor and tenderness.

ONE CLAM TO A HUNDRED GALLONS OF CHOWDER



This one clam would be enough for a hundred gallons of chowder. It is the Giant Clam, or *Tridacna gigas* found in the coral islands of the Pacific. Some specimens weigh 400 pounds or more!

All members of the clam group are mollusks of the bivalve group; that is, they have two shells connected by a muscular hinge (*see* Mollusks). The common or soft-shelled clams burrow in the sand under water for several inches, extending a curious siphon tube to the surface of the soil, through which they draw water and get the tiny sea creatures on which they feed. When alarmed the clam will draw in this tube suddenly; when the tide is out this causes a spurt of water, which gives away its hiding place to the clam-digger. The burrowing apparatus of the clam, which it uses with great skill and speed, especially when young, consists of a sort of "foot" which projects from the shell at the end opposite to the siphon. The soft-shelled clam lays an immense number of eggs, which float about in the sea until they hatch at the end of a few hours. Young clams swim near the surface for a time, but after some weeks take up life on the bottom. After two months they start to burrow to escape from the crabs, eels, and starfish, which devour them in great quantities. Besides being a valuable article of human food, clams are used as bait, especially by cod fishermen.

Another common variety of clam on the Atlantic coast is called by the Indian name *quahaug*. It is called also "round" or "little-neck" clam, and is valued even more highly as a table delicacy, especially for making clam chowder. These live below the low water mark, and are gathered with special dredges.

Closely related to the clam family are the long dark-shelled sea mussels, common on both sides of the Atlantic. In Europe they are cultivated and considered a delicacy ranking with the oyster. The so-called fresh-water clams of American lakes and rivers are members of the mussel family. They are found in the Mississippi and its tributaries, and were formerly eaten by the Indians. They often contain pearls of great beauty (*see* Pearls), and recently great quantities of the shells themselves have been used for making mother-of-pearl buttons. As a result, the Middle West mussel-beds have been exploited so thoroughly that some species are threatened with extinction (*see* Buttons).

The largest shell-fish in the world is the "giant clam" of the coral islands in the Pacific. These creatures are said to live from 60 to 100 years, and their shells often weigh 400 pounds or more. Their meat is eaten by the natives, who formerly also used their shells to make axes and other primitive weapons.

Scientific name of soft-shelled clams, *Mya arenaria;* of the quahaug, *Venus mercenaria;* of sea mussel, *Mytilus edulis;* of fresh-water mussels, *Unionidae* or *Anodonta;* of the giant clam, *Tridacna gigas.*

CLARK, GEORGE ROGERS (1752–1818). The United States owes to this famous backwoods leader, mighty hunter, and noted Indian-fighter the conquest of the Old Northwest, as we sometimes call the region now included in the five states of Ohio, Indiana, Illinois, Michigan, and Wisconsin.

George Rogers Clark was a Virginian who had in early life adopted the career of a surveyor. As such he removed to Kentucky in 1776, where he was a leader among the rugged pioneers of that region. He soon became convinced that the Indian raids, from which the settlers suffered, were incited by the British. In this belief Clark obtained a commission as lieutenant-colonel from Patrick Henry, the governor of Virginia, of which Kentucky was a part, and with the commission, permission to raise a force of 350 men for the conquest of the Northwest. After many difficulties Clark succeeded, by May 1778, in obtaining 150 backwoods riflemen. With this small band he started on his campaign, reaching the little French village of Kaskaskia, Ill., on the Mississippi River, on July 4. He completely surprised the British garrison stationed there, and took possession of the town. The capture of the French village of Cahokia, likewise on the Mississippi, and Vincennes on the Wabash, soon followed, and though the English under General Hamilton of Detroit at one time recaptured Vincennes, the posts were all in the hands of Clark at the close of the Revolution. This fact was one of the considerations which led England, in the treaty of peace, to cede to the United States the territory between the Allegheny Mountains and the Mississippi River instead of giving it to France or Spain.

GEORGE ROGERS CLARK

Conqueror of the Old Northwest in the American Revolution.

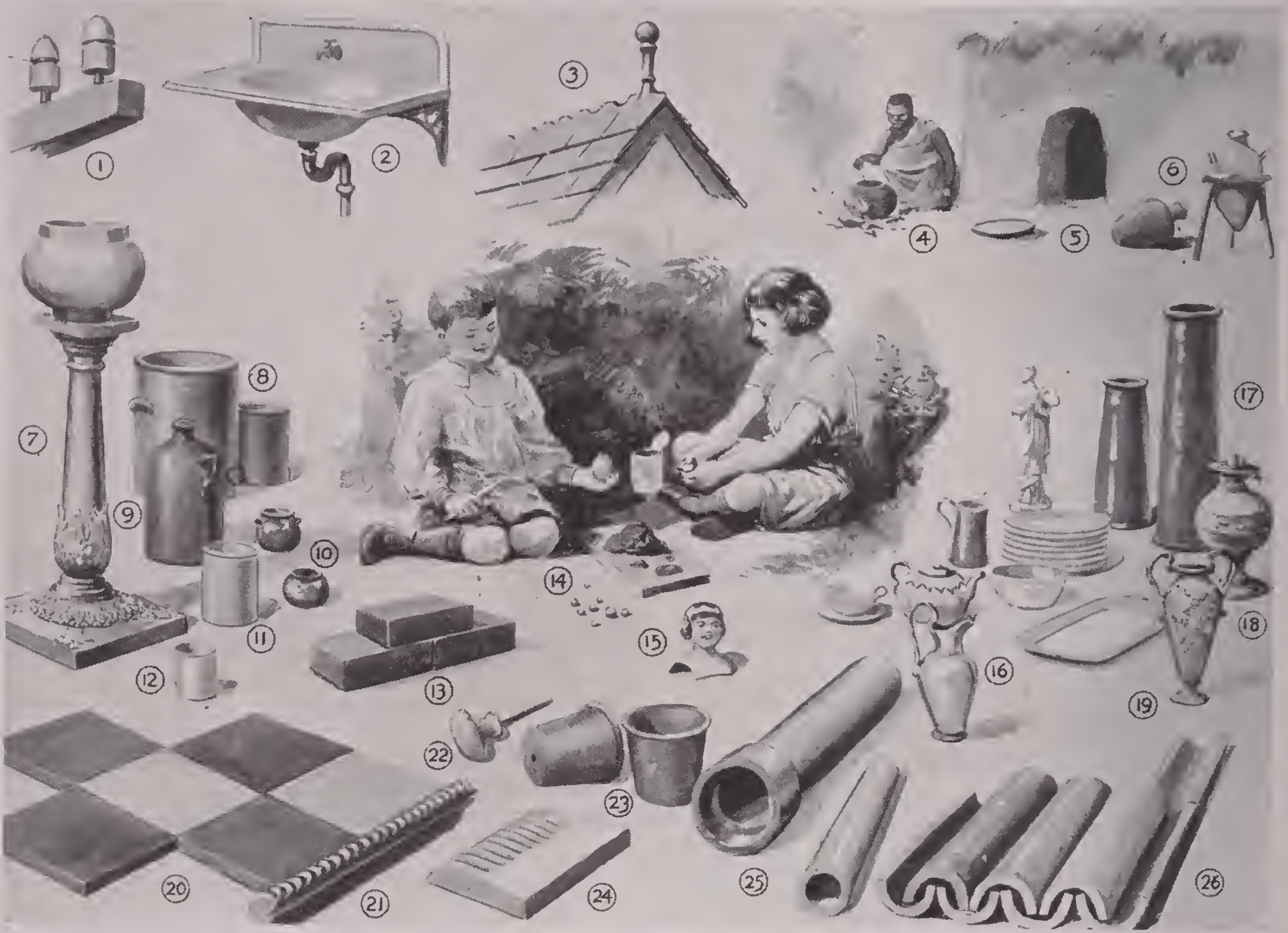
This expedition to the Northwest was largely financed by Clark himself, and at first no effort was made by Virginia to reimburse him. Finally, however, in payment for his services and for the money he had expended, the state ceded to him 8,049 acres of land in the present state of Indiana. Owing to the abundance of free land at the time, the grant was of little value; so, disgusted by this apparent ingratitude of his country and its neglect of the interests of the Western settlers, Clark in 1793 accepted a commission in the French armies from Genet, the French ambassador to this country. Owing to Genet's recall, the scheme to conquer the Spanish possessions west of the Mississippi for France was abandoned, and Clark returned to his land near Louisville, Ky., where he died in poverty and alone.

His brother William (1770–1838) was associated with Lewis in the famous Lewis and Clark Expedition (*see* Lewis and Clark Expedition).

CLAY. Since the days when man first began to make shelters of wattled twigs daubed with mud, clay has been one of his most important building materials. It was learned long ago that if clay is baked at a sufficiently high temperature it becomes almost as hard as rock, and men early molded and baked pottery to hold their food and drink. From these two primitive uses have developed many others, and today clay plays a big part in modern life.

The portland cement which enters into our great concrete buildings, bridges, and pavements has clay in its composition. Bricks, drain pipes, and tiles are merely clay of various kinds, with other substances added, and baked in great heat. All our pottery, from the heaviest mixing bowls in the kitchen to the most fragile and delicate porcelain tea service, is made of clay. Glazed paper is stiffened with clay, and clay enters into many other articles, such as door knobs, electrical insulators, and bathroom fixtures.

TWENTY-SIX COUSINS OF OUR LITTLE MUD PIES



Everybody knows you can make mud pies and roll marbles out of clay. But how often do we think of the wide range of manufactured articles for which we have reason to be grateful to this dust of Mother Earth? Here are some of them: (1) Telegraph Insulators; (2) Sanitary Fittings; (3) Terra Cotta Building Materials; (4) Native Cooking Pots; (5) Huts; (6) Ancient Amphorae, or Jars; (7) Ornamental Flower Bowls; (8-12) Jars, Jugs, and Pots for various uses; (13) Bricks; (14) Marbles; (15) Dolls' Heads; (16) Tea Sets, Plates, Platters; (17) Chimney Pots; (18) China Lamps; (19) Vases; (20) Paving Tiles; (21) Molding; (22) Door Knobs; (23) Flower Pots; (24) Stove and Fireplace Packings and Linings; (25) Drain Pipes; (26) Roofing Tiles.

What is this useful substance which serves man for so many purposes? Pure clay is an especially plastic and tenacious form of earthy matter, formed by the decay of certain minerals, chiefly feldspar. Pure clay consists chiefly of silica and alumina, but most clays contain various other substances, giving the various kinds of clay their distinctive color and other qualities. Iron oxide, silica, lime, carbonate, magnesium carbonate, potash, and soda are among the common constituents. Clay owes its stickiness or tenacity when wet chiefly to the smallness of its grains.

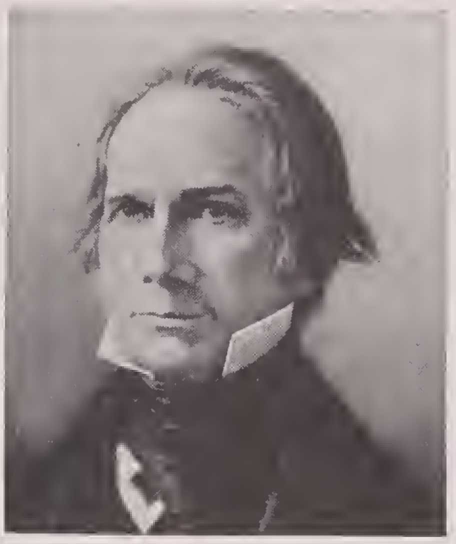
We are all familiar with the story of the captive Israelites in Egypt who were forced to make bricks without straw. But to E. G. Acheson, a distinguished American chemical inventor, this narrative was more than a story. He wondered if straw really did make a difference in the quality of bricks. To satisfy his curiosity he boiled a quantity of straw and mixed the resulting dark red liquid with clay, and found that the plasticity was very greatly increased. The active agent, he satisfied himself, was tannin and thus an important principle was rediscovered. Clay treated with tannin is called "Egyptianized clay." The strength of the clay is greatly increased, and its cracking tendencies lessened.

When beds of clay have been solidified by cremation, or by pressure beneath other sediments, they form the rock known as *shale.* Ground-up shale mixed with water becomes clay again. *Slate* is a variety of rock formed by the great compression of shale. *Loam* is a mixture of clay and sand, with or without lime.

Clay is widely distributed and is found in formations of various geological ages. Deposits occur in many parts of the United States and Canada.

Fire clays contain a low percentage of fusible material and for this reason can withstand very high temperatures. *Kaolin* or "china clay" is used in making pottery. The term kaolin comes from the Chinese word *kao-ling*, meaning "lofty hill," because it was first used from a hill in China which bore this name. Kaolin burns white or nearly so. Extensive deposits of kaolin are found in England, France, and Germany. In the United States good kaolin is not abundant, but there is some in Pennsylvania, North Carolina, and Georgia. *Brick clays* include almost any impure clay that can be made into bricks. A mixture containing considerable iron burns red, while one containing a large percentage of lime makes cream-colored brick. Brick material of good or fair quality is found in almost every state in the Union. Many bricks are made from ground-up shale. Paving brick requires a clay that contains a high percentage of lime, iron, and an alkali, that it may vitrify or glaze well in burning. *Adobe clay* is a clay used in the South and Southwest for making sun-dried brick.

CLAY, HENRY (1777–1852). For 40 years Henry Clay exercised a leadership in the politics of the United States that has seldom been equaled. He was a man of charming personal traits, powerful emotional oratory, and brilliant statesmanship, and he was greatly loved and honored by hundreds of thousands of his fellow countrymen. But like his great contemporaries Calhoun and Webster, he failed to gain the presidency and repeatedly saw that prize go to men of lesser powers. In part the explanation of this lies in the honesty and patriotism of his policies which created enmities which less prominent men escaped.



HENRY CLAY
Great Orator and Political Leader

Clay was born on a frontier farm in the western part of Virginia, in a low swampy neighborhood called "the Slashes." He attended school irregularly in a one-room log-cabin schoolhouse, and helped his widowed mother between times by plowing the fields and carrying to the mill the harvested grain. In after-days he was often called the "mill-boy of the Slashes." Encouraged by his stepfather, he studied law and was admitted to the bar when 20 years of age. Shortly afterwards he removed to Kentucky, where his great gifts of leadership and eloquence soon won for him a place in the Kentucky Legislature. After two years of brilliant service he was chosen to fill a vacancy in the United States Senate (in 1808), and although he had not yet reached the legal age of 30, he was permitted to take his seat. In 1811 he was elected to Congress, and on the very first day of the session was chosen Speaker of the House. With the exception of one term, which he refused, he remained representative and Speaker for the next 14 years.

Throughout his political career Clay took an active part in the measures of the day. He advocated a protective tariff and favored a policy of "internal improvements"—that is, road-making, canal-building, and the like, by the national government—on a wide scale throughout the country. This he called "the American system." In the beginning of his career he especially distinguished himself by his energy in bringing about war with England. Ably supported by John C. Calhoun, the two "war hawks," as they were called, by their combined eloquence persuaded a reluctant Congress and President to a declaration of hostilities against Great Britain in 1812. At the end of a rather inglorious war Clay was chosen one of the commissioners who drafted the treaty of Ghent. By a curious turn of fortune the conflict, so zealously advocated by Clay, brought forth as its chief hero General Andrew Jackson, the man who later on was to prove the chief obstacle between Clay and the White House.

An unfortunate circumstance connected with Clay's first candidacy for the presidency reflected unhappily on the rest of his public life. In the election of 1824 he was one of four candidates, none of whom received a majority of votes. In such an emergency the choice of president rests with the House of Representatives. Clay stood fourth on the list and, in accordance with the Constitution, was dropped from the list of candidates. Crawford, another candidate, had been stricken with paralysis. The choice therefore lay between John Quincy Adams and Andrew Jackson, the two remaining candidates. Clay used his influence in favor of Adams who was elected. When Adams appointed Clay to be his secretary of state the charge of "bargain and corruption" was at once raised by Jackson's friends. In fact there was no shred of evidence on which it could rest. But eccentric John Randolph of Virginia spoke openly in Congress of "the coalition of the Puritan with the black-leg"; and referred to Clay as "that brilliant being, who, like a rotten mackerel, shone and stank in the moonlight." Clay immediately challenged Randolph to a duel. After ineffective shots by both duellists, Randolph fired his pistol in the air with the remark, "I do not fire at you, Mr. Clay." Thus ended what Benton called "the last high-toned duel I have witnessed." The "bargain charge," in spite of its injustice, followed Clay to the grave.

In 1832 and in 1844, Clay was again a candidate for the presidency but was defeated, first by General Jackson and then by James K. Polk. This third defeat, by a man whom Clay had ridiculed, was not very gracefully received. In 1840 and in 1848 Clay had sought the presidency but was defeated in the Whig party convention, first by General Harrison and then by General Zachary Taylor.

In addition to 12 years in the House of Representatives, Clay served for almost 20 years in the Senate. It was here that he earned the name of the Great Pacificator by finding solutions for numerous controversies between North and South.

Three times Clay was able by his compromises to bring about concessions which while satisfying neither North nor South delayed the inevitable struggle. In 1820 while still Speaker of the House of Representatives he played an important part in the Missouri Compromise. In 1833 when South Carolina attempted to nullify the tariff and threatened to secede from the Union, he stepped into the breach with the compromise tariff of 1833. And in 1850, at the most severe crisis the country had yet faced, he again came forward as the author of the Compromise of 1850, which delayed the Civil War for a decade.

Much of Clay's success in compromising differences was doubtless due to his personal charm and magnetism. Anecdotes without number are told in which his charm of manner and personality are extravagantly praised. "A perfectly fascinating and irresistible man," said Charles Dickens. "I profoundly loved Henry Clay for his generous nature, his gallant bearing, and his thrilling eloquence," was the testimony of Horace Greeley. His marvelous voice has been likened to the pipe of an organ with a thousand variations, and under the spell of his eloquence vast crowds laughed or wept as he wished, shouted with him or fell to silence at his whisper.

Clay died in June 1852, two years after his distinguished contemporary Calhoun. Five months later the voice of Daniel Webster was also stilled, and the "Great Trio of Oratory," as they were called, passed into history. One of the greatest of American historians says: "Other Americans have been intellectually greater, others have been more painstaking, others still have been greater benefactors to their country; yet no man has been loved as the people of the United States loved Henry Clay."

WHITE CLEMATIS IN BLOOM

From the beauty of this single spray of white Clematis, you can imagine the beauty of a whole wall covered with it!

CLEM'ATIS. Among all climbing plants there is none more attractive than the clematis that covers our porches and walls with its white or purple blossoms. And when it has gone to seed it is more attractive still, for its gray silky tufts of seed-clusters look like wreaths of leaf smoke puffing over the vine. When they are ripe the wind catches the long slender plumes, and away they sail, carrying the seeds far and wide.

One largely cultivated variety is the white clematis, or virgin's bower, which is covered with sprays of fragrant white blossoms. The well-known blue clematis, with its handsome large purplish blossoms, came originally from Japan. It needs a rich soil.

The clematis is a genus of the crowfoot family (*Ranunculacae*). About 20 to 150 known varieties are found in the United States. The flower-clusters are generally blue or white, except in some mountainous parts of southern Europe and northern Africa, where the colors vary from pure white to yellow, deep purple, ruby, or scarlet. Scientific name of virgin's bower, *Clematis virginiana;* blue clematis, *Clematis florida.*

CLÉMENCEAU (*klā-mäṅ-sō'*), GEORGES BENJAMIN EUGENE (1841–). "The man who saved France in the hour of her deadliest peril!" It was no youthful Napoleon, no dashing military figure, who won this title at the close of the World War, in November 1918. It was a white-haired old man of 77, Georges Clémenceau, who a year earlier, when hopes of victory were shrouded in darkness, had boldly taken the fate of his exhausted country in his hands by accepting the position of prime minister.

But this old man soon proved that he had not been idly nicknamed "the Tiger" in French politics. A born fighter, he inspired his countrymen with a new vigor, and shares with Lloyd George of Great Britain, Wilson of the United States, and Orlando of Italy the glory of the measures which ended the war. He drove from power all who talked or hinted of compromise or defeat. His short squat figure, his laughing black eyes under the brim of a funny round hat, his great mustaches, became familiar to the soldiers in the trenches, who called him "Père Victoire" (Father Victory). He forgot friends and foes in his determination to win. To a group of his former political associates, who came seeking favors, he made the famous reply: "I am not here to play politics. I am making war." It was largely through Clémenceau that the Allied armies obtained in Marshal Ferdinand Foch the supreme military commander who brought victory.

A Teacher in Connecticut

Born in the department of La Vendée, in Brittany, on Sept. 28, 1841, Clémenceau followed his father's footsteps in the study of medicine. Before he was 20, he was thrown into prison for shouting "Long live the Republic!" on the streets of Paris during a celebration in honor of Emperor Napoleon III. When released he came to the United States, virtually an exile. He practiced medicine for a time in New York, then taught French in a girls' school at Stamford, Conn. Here he married a girl named Mary Plummer. The marriage ended some years later in a mysterious divorce.

In 1869 the first warnings of a new political crisis reached him from France. With that impulse for immediate action which marked every moment of his life, he rushed back to Paris and plunged at once into a public career. He was elected mayor of the district of Montmartre during the Franco-Prussian War of 1870–71, and did much to relieve the sufferings of the poor during the siege of Paris. In 1871 he was elected to the General Assembly and voted against ceding Alsace-Lorraine to Germany. From 1871 to 1875 he was a member of the Paris Municipal Council, and in 1876 was elected member from Montmartre to the Chamber of Deputies, where he soon became the leader of the Radical Republicans.

With an unswerving devotion to the principles of liberty, yet with a keen eye for practical policies, he attacked with equal zeal the Royalist reactionaries and the Socialist visionaries. He fought for the separation of church and state, yet refused to interfere with the liberty of education in church schools. Soon he was the most feared man in France and became known as the "breaker of ministries," having caused the downfall of one cabinet after another. His debates in the chamber were supported by his flaming editorials in his paper *La Justice.* He was compelled to fight and win seven duels before he was 40 years old.

In 1893 his name was dragged into the Panama Canal scandals. Though he proved all the charges unjust, he failed in the next election. "He's done for," said his foes with relief.

But they didn't know "the Tiger." After devoting himself for a short time to literary work, in which he showed a keen understanding of human nature and a high sense of art, he returned to journalism. At this time (1896–97) there burst into French politics the famous case of Capt. Alfred Dreyfus of the French army, who had been convicted with the aid of forged documents of selling military secrets to Germany and condemned to life imprisonment. Dreyfus was of a wealthy Jewish family and the case became the center of anti-Semitic agitation, which had long been smoldering in France. Clémenceau, at first indifferent, soon became convinced that the principles of liberty and justice were at stake. In a new journal, *L'Aurore,* he launched into a defense of Dreyfus and a bitter attack on the army clique responsible for his conviction. He was aided by the brilliant novelist Emile Zola, who published in *L'Aurore* his famous article 'J'Accuse' ('I Accuse'). It was largely due to these efforts that Dreyfus was finally cleared of blame in 1906.

GEORGES CLÉMENCEAU

This is "The Tiger" who piloted France through the period of deadliest peril in the World War and was largely responsible for turning defeat into victory.

Meanwhile "the Tiger" swept back into popular favor and was elected to the French Senate in 1902. In 1906 he became minister of the interior, and then prime minister, carrying on the government with a bold and vigorous hand. He was overthrown in 1909, but remained in the Senate, fighting always in his old slashing style, and founding a new paper called *L'Homme Libre* ("The Free Man").

Guides France to Victory in the World War

During the first years of the war of 1914–18 he kept up a constant attack on officials whom he suspected of half-heartedness or inefficiency. Then in 1917, after an attack on certain prominent men accused of spreading "defeatist" propaganda, he was called by President Poincaré to take the reins of government as premier, and guided France to victory.

Clémenceau was chosen to preside at the peace conference, where he fought on the one hand against the imperialists who demanded large annexations of German territory, and on the other sought practical guarantees for the future safety of France. It was during

THE "SERPENT OF THE NILE" IN HER ROYAL GALLEY

"Like Caesar before him, Antony lost his heart and his head. Forgetting his wife, Octavia, and the high duties he owed to Rome, the warrior became Cleopatra's willing slave. Balked of her hopes of ruling Rome with Caesar, the Egyptian queen now dreamed of accomplishing her ambition as Antony's consort. But the end was not long in coming. Antony's foes at Rome prevailed on the Senate to declare war on this dangerous woman. Instead of preparing for the conflict, the two lovers dreamed only of idle luxury. A battle was fought at Actium. The treacherous queen fled with her ships. Antony followed, and from being master of half the world became a hunted fugitive." Here we see Antony, deserted by his troops, yet so overpowered by Cleopatra's fascination that he is picturing to her the wealth and glory he proposes to lay at her feet when his foolish dreams come true.

this conference, on Feb. 19, 1919, that he was shot at and wounded by an unbalanced anarchist. His marvelous vitality, however, enabled him to recover and go on with his work.

In 1919 Clémenceau's policies were victorious in the French elections, but "the Tiger," then 78 years old, decided to quit his great public burdens as premier. Reluctantly, he consented to run for the less tiring office of president of the French Republic, but was defeated by his enemies, who feared his personality and no longer felt the need of his energy and talents.

Clemens, Samuel (1835–1910). The American humorist and novelist more familiarly known by his pen-name of "Mark Twain." (*See* Twain, Mark.)

Cleopatra (*klē-ō-pā'trä*) (69–30 B.C.). Picture the conquering Julius Caesar seated in a room in the citadel of Alexandria, Egypt. Two slaves enter, bearing on their shoulders a magnificent rug.

"Cleopatra, Queen of Egypt, begs Caesar to accept this gift," says one of them.

Gently they put their burden down, unroll it, and out springs Cleopatra herself!

Dazzled at the sight of such loveliness as he had never before seen, the stern warrior surrendered to the charms of Cleopatra, then a girl of 19 or 20, and fell in with all her plans. He helped her crush her foes and slay her brother, who shared the throne of Egypt with her.

A few years later Caesar fell under the daggers of conspirators at Rome. Mark Antony, who had triumphed in the war which followed, summoned the lovely queen to appear before him to answer charges that she had helped his enemies. The wily "serpent of the Nile" came—but not as a penitent. She sailed up the River Cydnus in Asia Minor, where Antony then was, in barbaric magnificence.

> The barge she sat in, like a burnished throne,
> Burn'd on the water; the poop was beaten gold;
> Purple the sails, and so perfumed that
> The winds were love-sick with them; the oars were silver;
> Which to the tune of flutes kept stroke.

And in the center of the galley, under a canopy embroidered with gold, lay Cleopatra, arrayed like Venus rising from the sea, while "pretty dimpled boys, like smiling Cupids," fanned her with brilliantly colored fans of ostrich feathers.

Like Caesar before him, Antony lost his heart and his head. Forgetting his wife Octavia and the high duties he owed to Rome, the warrior became Cleopatra's willing slave. Balked of her hopes of ruling Rome with Caesar, the Egyptian queen now dreamed of accomplishing her ambitions as Antony's consort. But the end was not long in coming. Antony's foes at Rome prevailed on the Senate to declare war on this dangerous woman. Instead of preparing for the conflict, the two lovers dreamed only of idle luxury. A battle was fought at Actium (31 B.C.), and the treacherous queen fled with her ships at the first opportunity. Antony followed her, deserted by his troops, and from being master of half the world became a hunted fugitive.

For the last time Cleopatra tried her powers of fascination on Antony's conqueror, Octavian—soon to become Augustus, the first Emperor of Rome. But Octavian was made of sterner stuff than Antony, and was proof against her blandishments. Antony soon after killed himself. Cleopatra, proud and queenly to the last, rather than go to Rome in chains, ended her life—so the story goes—by letting a poisonous asp bite her. Most beautiful and heartless of women, Cleopatra's bones still lie, it is said, with those of her betrayed lover under a powder magazine in the harbor of Alexandria.

STORY *of* CLEVELAND'S *Two* ADMINISTRATIONS

At first glance there does not seem much likeness between President Cleveland and Presidents John Adams and John Quincy Adams. But in Cleveland's sturdy independence of character, honesty, and fearless devotion to duty, and in the widespread unpopularity that fell to his lot even within his own party, there is much resemblance to his New England predecessors. Like them also, Cleveland was defeated for reelection after one term; but unlike them he was later triumphantly reelected, thus becoming the only President to serve two terms not in succession.

Cleveland, Grover (1837–1908). "My ancestry," Mr. Cleveland once said, "was made up of God-fearing industrious men and good women who did their duty as best they could, and this is all I know or care to know about them, since there could be no better origin than such as these."

Born at Caldwell, N.J., Stephen Grover Cleveland (he dropped the name Stephen when a boy) was the fifth of nine children of a Presbyterian minister, whose salary rarely exceeded $600 a year. When young Grover was four years of age the family removed to Fayetteville, N.Y., and subsequently to Clinton in the same state. He was reared in a home where the atmosphere was kindly and Christian, and all the children received a fair education.

When Cleveland was just ready to enter Hamilton College, his father died, and it became necessary for the young man to seek employment to help support the family. He borrowed $25 from a neighbor and started out to seek his fortune in the West. But he got no farther than Buffalo, for there an uncle persuaded him to remain, procuring for him a position as clerk in a law office. He studied law with the same diligence and perseverance which marked all his activities, and in 1859 was admitted to the bar. When the Civil War came and he was unable to enlist because of the necessity of supporting his mother and sisters, he borrowed money in order to hire a substitute.

Cleveland's political life began with his appointment as assistant district attorney in 1863. In 1870 he was elected sheriff. While serving in this office he himself sprung the trap which hanged a convicted criminal rather than hand over that unpleasant task to a deputy. "Public office is public trust"—an expression attributed to Cleveland in one of his presidential campaigns—well describes his attitude towards every public position that he ever held.

His public career advanced a stage when, in 1881, he was elected mayor of Buffalo on the Democratic ticket. Good men of both parties looked to Cleveland to bring order out of chaos in the city's affairs, and they were not disappointed. He put the business of the city on a footing of efficiency.

Then, in 1882, Cleveland was elected governor of New York by an overwhelming vote. In this office he pursued the same fearless energetic course which had marked his career in Buffalo. He vetoed so many bills which he regarded as bad that he won for himself the nickname of "the veto governor." Although the baser elements of his party were offended by his policy, he won a large following among the better and more intelligent classes.

Rapid Rise to the Presidency

Cleveland had been elected governor before his term as mayor was finished. Before his term of office as governor had expired he was elected president of the United States. Nominated in 1884 by the Democrats, with Thomas A. Hendricks of Indiana as canditate for vice-president, Cleveland's Republican opponent was James G. Blaine, one of the most brilliant and popular leaders of that triumphant party. A bitter campaign followed, in which the personal character of each candidate was viciously assailed. When Cleveland's campaign managers asked him how they should make answer to a minor scandal which had been dragged out of his past, he answered, "Tell the truth." The vote was exceedingly close, but through the support of independent voters (called "Mugwumps"), Cleveland won.

Cleveland's first term as president (1885–1889) was marked by the same notable independence which he had displayed as mayor and as governor. From the first he showed a disposition to take the entire responsibility for the administration on his own shoulders. He defied the Senate's demand for certain documents, declaring that the president was not subject to its orders in such matters. He used the veto with such frequency that he became known as "the veto president." It is said that he vetoed more bills than all the presidents who had preceded him put together. Most of these were private pension measures which, after personal investigation, Cleveland decided were not founded on merit.

On the question of the application of the Civil Service Law (passed in 1882) President Cleveland found himself between two fires. His "Mugwump" supporters were advocates of civil service reform, but on the other hand the Democrats were hungry for the spoils of office after their 24 years' exclusion. Cleveland completely satisfied neither section of his followers. He refused to make a wholesale removal of Republican office-holders, yet he did make enough changes to dissatisfy the reformers. History will credit him, however, with materially advancing the cause of civil service reform.

In 1888 Cleveland was a candidate for reëlection, but was defeated by the Republican candidate, Benjamin Harrison. This result was in part caused by the revolt of certain elements of his own party and the lukewarmness of the "Mugwumps"; it was chiefly due, however, to the bitter opposition of the manufacturing interests to Cleveland's tariff policy (*see below*). Following his defeat Cleveland retired to New York City, and for the next four years quietly practiced law. In 1892 he was again nominated over the opposition of the Democratic leaders of his own state. This time he triumphantly defeated President Harrison by a vote in the electoral college of 277 against 145.

This surprising result was chiefly due to the tariff question. On principle Cleveland disbelieved in a protective tariff. The growth of a large surplus in the United States treasury showed, moreover, that the tariff rates at that time were higher than was needed to provide revenue for the government. Cleveland believed that such a surplus could only lead to reckless extravagance in national expenditures. Accordingly he had urged tariff reduction, and in 1887 had broken all precedents by devoting to this subject his entire annual message to Congress. A revenue tariff, called the Mills bill, had then passed the House, but it was so amended by the Senate that the House refused to accept it. The tariff thus became the leading issue in the election of 1888, and the main cause of Cleveland's defeat. Since then the Republicans had used their victory to further increase tariff rates in the McKinley tariff of 1890.

Difficulties of his Second Administration

Cleveland's second election to the presidency, in 1892, with Adlai E. Stevenson of Illinois as vice-president, clearly showed that the country disapproved of the Republican tariff policy. Nevertheless in his second administration Cleveland was little more successful in securing from a Democratic Senate a "tariff for revenue only" than he had been in his first term from a Republican Senate. Indeed, he was so dissatisfied with the Wilson-Gorman bill, as it was finally passed, that he styled it an example of "party perfidy and dishonor," and allowed it to become a law without his signature. The next year the Supreme Court still further increased popular discontent by declaring the income-tax provision unconstitutional.

Altogether Cleveland's second administration (1893–1897) was a stormy one. Almost at its beginning, speculation, extravagance, the prospect of a change in the tariff, and uncertainty as to the currency combined to produce the Panic of 1893. Scores of banks failed, and hundreds of firms became bankrupt; factories were closed, thousands of workmen were discharged, hard times came, and labor difficulties arose.

The chief cause of the trouble was the Silver or Currency question. By 1893 the market value of silver had fallen so greatly through increased production that a silver dollar was actually worth in gold only 56 cents. President Cleveland sought to remedy the situation by practically abandoning the "double standard" of money (bimetallism) and placing the country on the single or "gold" standard. To this end he forced Congress to repeal a law which required the Treasury to purchase a certain quantity of silver each month. He also induced it to authorize the sale of bonds for additional gold so that the Treasury would always be able to give gold in exchange for the silver and paper currency which remained in circulation. These measures were sound and statesmanlike, but they were bitterly opposed by radical members of his own party, who sympathized with the principles of the Populist party, then strong in the West.

GROVER CLEVELAND

CLEVELAND'S ADMINISTRATIONS

1885-1889

Civil Service Reform Aided.
Many Private Pensions Bills Vetoed.
Haymarket Riot in Chicago (1886).
Interstate Commerce Act Establishes Government Regulation of Railroads (1887).
Anti-Polygamy Law against Mormons Passed (1887).
New Chinese Exclusion Act (1888).
Tariff "for Revenue Only" Defeated (1888).
Department of Agriculture Created (1889).

1893-1897

Hawaiian Annexation Treaty Withdrawn (1893).
Panic of 1893.
Silver Purchase Act Repealed and Gold Standard Supported.
Chicago World's Fair (1893).
Great Railroad Strike Put Down (1894).
Controversy with Great Britain over Venezuela (1895).

Labor Troubles and Important Legislation

Serious labor difficulties also occurred in both of Cleveland's administrations. In 1886 a memorable riot took place in Haymarket Square, Chicago, in which bombs thrown by anarchists instantly killed seven policemen and wounded sixty more. Following the panic of 1893, discontent was widespread and strikes and riots increased in number and violence. As the result of a strike by employees of the Pullman Company in 1894, railways were "tied up" all over the country, property was wrecked or burned and many men were injured and killed. Order was finally restored only when Cleveland, with his customary directness and courage, sent troops to Chicago to protect the mails and federal property.

Much important legislation was passed in Cleveland's administrations, including the creation of a Department of Agriculture; and an Interstate Commerce Commission, the latter to regulate railroads and other common carriers doing an interstate business. Four new states—North Dakota, South Dakota, Montana, and Washington—were admitted to the Union. Not the least interesting event of his second administration was the Columbian Exposition, commemorative of the 400th anniversary of the discovery of America, held at Chicago in 1893. This proved one of the most splendid exhibitions ever given; it cost more than $25,000,000, and was attended by more than 27,000,000 visitors.

In Harrison's administration a revolution had occurred in the Hawaiian Islands against the rule of the native queen Liliuokalani, and when Cleveland became president the second time a treaty of annexation to the United States was before the Senate. Cleveland withdrew this treaty and prevented annexation at that time, because he found that the success of the revolution was largely due to support improperly given to it by the American diplomatic agent in Honolulu. In the Canadian fisheries dispute with Great Britain, Cleveland vigorously asserted American rights. He also threw the protection of the Monroe Doctrine about Venezuela when Great Britain sought to force that South American republic to admit boundary claims which to many persons seemed unjust. For a time war seemed imminent, but in the end Great Britain consented to arbitrate. The award on the whole was favorable to Great Britain, but Cleveland's action at this grave time is usually considered one of his greatest services to the nation.

After Retiring from the Presidency

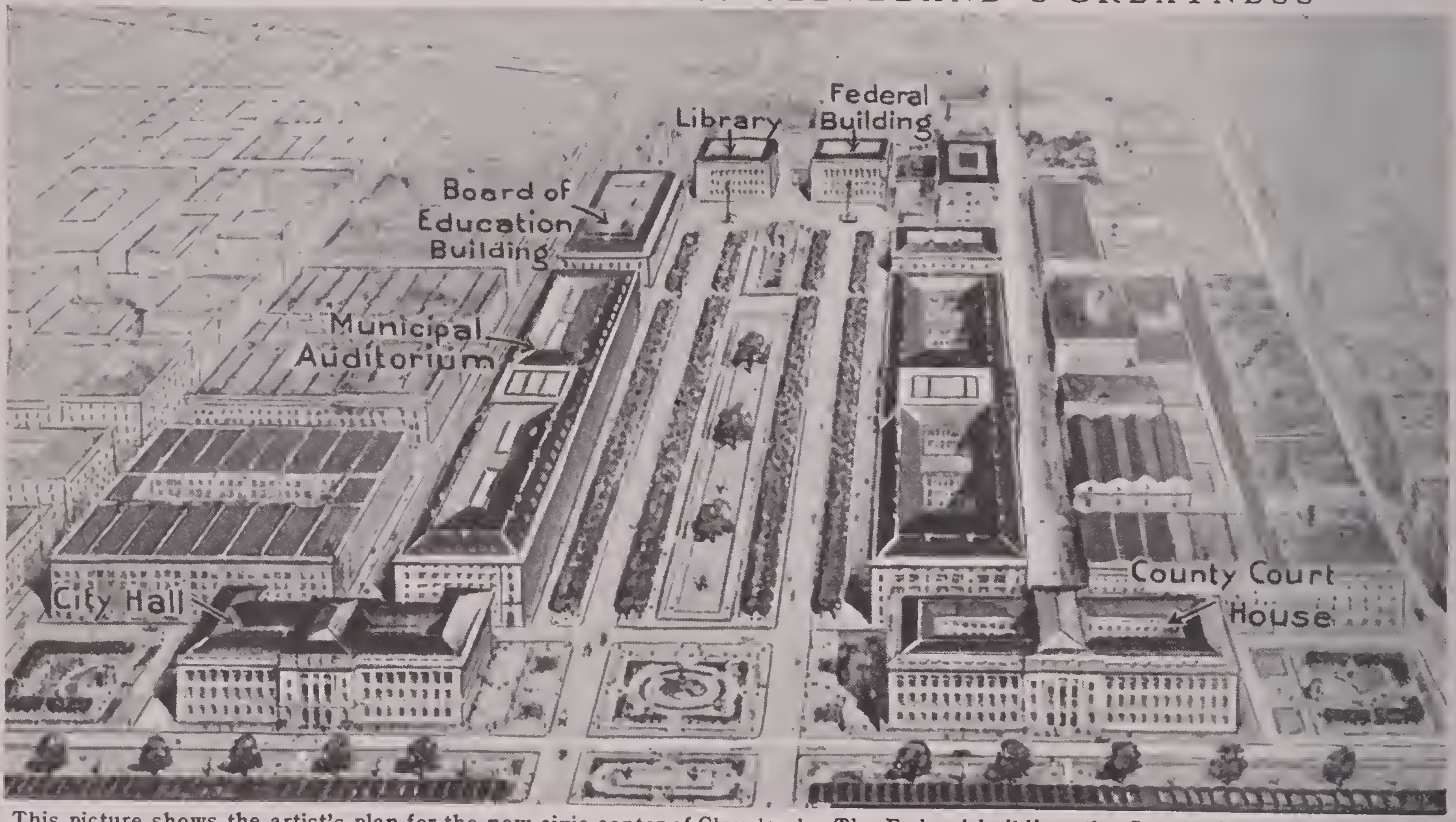
After he left the presidency, Cleveland resided at Princeton, N.J. Here with his wife and children—he had married Miss Frances Folsom during his first term —he lived quietly until his death in 1908. As a lecturer and trustee of Princeton University he took an active interest in the life of the students, and many a poor boy working his way through college received unexpected help from the ex-president. After his death he was buried at Princeton and a beautiful memorial tower was erected at the University in his honor.

Cleveland was very fond of children and young people of all ages. It is said that after his retirement in Gray Gables, Princeton, he would often spend a whole day gravely mending toys for his small friends. In recreation he was as doggedly in earnest, as painstaking and thorough, as in the more serious affairs of life. An enthusiastic fisherman, he would sit in his skiff for hours at a time enduring heat, cold, rain, or fatigue with amazing patience.

Slow in forming a judgment, steadfast in holding it, courageous and strong in trouble, calm in the face of danger or defeat, he steered his course with a farseeing eye and a steady hand. No one familiar with his career will question the truth of words he spoke near the end of life, "I have tried so hard to do right."

CLEVELAND, OHIO. Lying on the south shore of Lake Erie, between the rich coal and oil regions of Pennsylvania, the iron fields of the Lake Superior district, and the natural wealth of the Ohio valley, Cleveland enjoys industrial advantages of unusual value. And when we consider further that this famous Ohio city is the meeting point of the Great Lakes water traffic and of the principal eastern and mid-western railway systems, it is easy to understand how Cleveland more than doubled its population between 1900 and 1920, becoming the fifth largest city in the United States.

A CIVIC CENTER WORTHY OF CLEVELAND'S GREATNESS



This picture shows the artist's plan for the new civic center of Cleveland. The Federal building, the County Court House, and the City Hall are grouped with other buildings to form an impressive unit worthy of Ohio's great city.

The Cuyahoga River cuts the city in two and its mouth forms a fine harbor, which is protected by a breakwater two miles long and a half a mile from shore. The harbor basin is usually crowded with huge freight boats, bringing in iron ore, carrying coal and coke, and countless products of Cleveland's factories, while passenger vessels bound to and from Duluth, Detroit, Buffalo, and other lake ports add to the busy scene. Iron ore, coal, and coke lead in amount, with grain and live stock next.

Cleveland is a leading center for the production of steel ships, wire, nails, bolts, clothing, paints, machinery, and automobiles. It is one of the most important markets in America for fresh-water fish, and handles great quantities of lumber and hardware. Other leading establishments are rolling mills, meat-packing plants, knitting mills, tobacco factories, and printing plants. Cleveland is the reserve city for Federal Reserve Bank District No. 4, which includes Ohio and parts of Pennsylvania and Kentucky.

Cleveland is beautifully situated on land that rises gently from the lake to an altitude of 115 feet. The city proper extends along the lake about 12 miles, and extends up both sides of the deep and broad Cuyahoga valley which is spanned by a number of imposing steel and masonry viaducts. In the valley are many of the manufactories, freight depots, railroad yards, and coal and iron docks. The larger part of the city lies east of the river. The business center is arranged around Monumental Park or the Public Square, and from this, streets radiate to all parts of the city.

Cleveland has one of the most excellent systems of parks and boulevards in the United States. The entire valley of Doan Brook was presented to the city by John D. Rockefeller and others, and was converted into a narrow park, about 4 miles long, connecting Wade and Gordon parks. The broad streets in the residential sections, lined with great trees, are a distinctive feature of the city, which is comparatively free from crowded tenement districts. Cleveland is often called the "Forest City" because of its many parks and tree-studded private grounds.

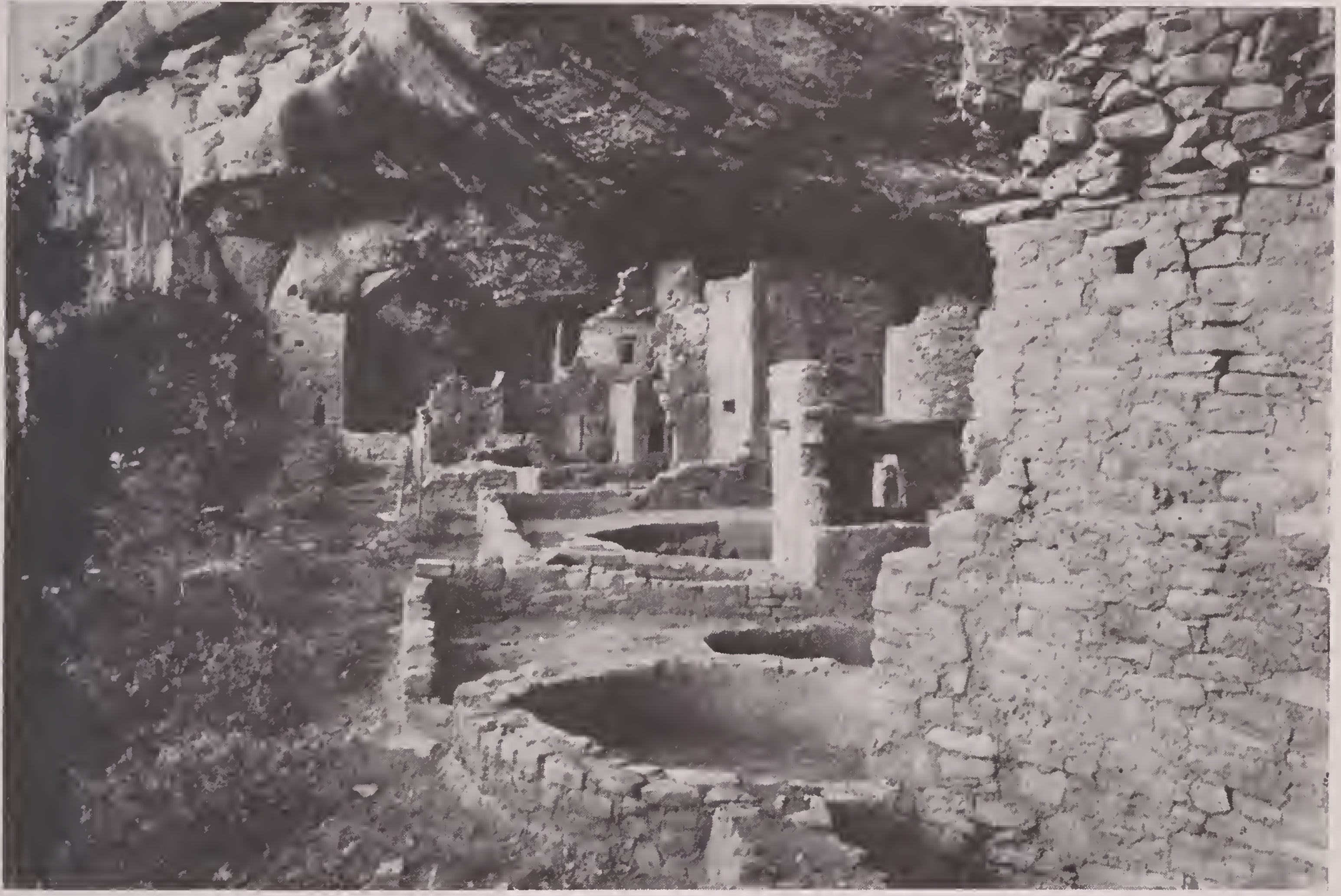
An elaborate plan of civic improvement, known as the "group plan," was begun in 1902. By this plan the public buildings are to be grouped in the center of the city at a cost of $35,000,000. The federal building, the county court house, and the city hall—already completed—the public library, the museum and the union passenger station, all built of granite, will form a huge rectangle, connected by a wall 600 feet wide extending from Superior Avenue to the lake.

Cleveland has many beautiful churches and residences and many educational institutions, Western Reserve University and Case School of Applied Science being two of the leading institutions of the country. The city is also one of the foremost in the United States in its methods of caring for the poor and in its reform institutions.

Cleveland was first settled in 1796 by Moses Cleaveland and a party of surveyors, who were sent from Connecticut to investigate the possibilities of the strip of land known as Western Reserve (*see* Connecticut). For a time the name was spelled Cleaveland, but about 1831 it was permanently changed to its present form—because, it is said, the "a" made it a misfit in the headline of a newspaper. When the Ohio Canal was opened as far as Akron in 1827, the real development of the town began, and in 1836 Cleveland was incorporated as a city. Cleveland has given the country many distinguished men, among them President James A. Garfield, to whom there is a fine memorial in Lakeview Cemetery; John Hay, secretary of state during the McKinley administration; Tom L. Johnson, the father of the three-cent street-car fare; and Marcus A. Hanna, at one time United States senator and a Republican party leader. John D. Rockefeller laid the foundation of his great fortune in Cleveland. Population, about 800,000.

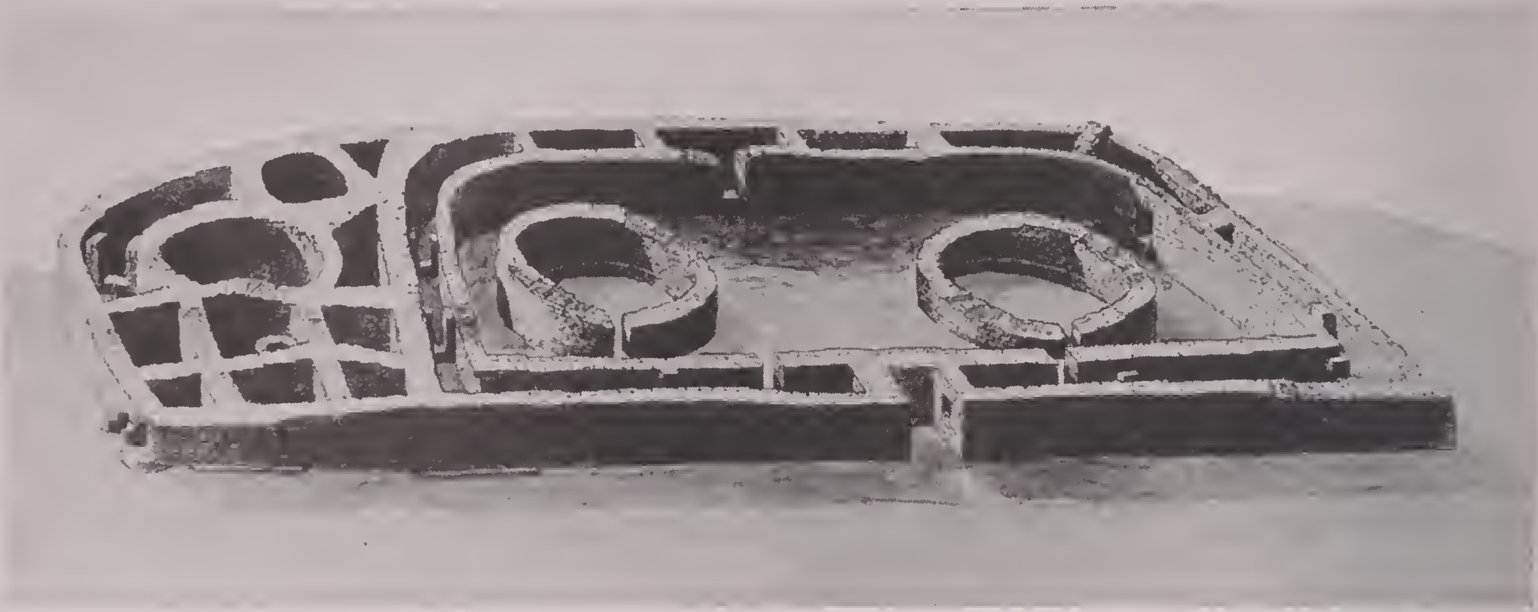
CLIFF DWELLERS. Among the deep canyons in the rough desert regions of southern Colorado, of Utah, New Mexico, and Arizona, are found today the ruins of ancient cliff dwellings, which tell us of an interesting phase of Indian life of long ago. They are the remains of villages built by tribes that had learned to cultivate the ground, make pottery, cloth, baskets, and stone implements, and who thus rose above their wild neighbors in civilization. But what they had gained in culture they lost in the art of

WHY THE INDIANS OF TODAY SHUN THESE RUINS OF YESTERDAY



Probably 300 people once lived in the three-story Cliff Dwellers' "apartment house," now known as "Spruce Tree House" in Mesa Verde Park in Colorado. But the Indians of today shun these ruins. They believe them to be still inhabited by the spirits of the dead, whom they call the "Little People." When a telephone line was being built to Mesa Verde Park, the Indians were greatly excited and said the wires wouldn't "talk," because the Little People didn't like these new things.

CLIFF DWELLERS' TEMPLE OF THE SUN



The sun's importance in the life of man is so obvious that sun worship is found among widely separated peoples all around the globe. Until 1915 no structures except cliff dwellings had been found in the Mesa Verde Park; but then the ruins of a Sun Temple were discovered. This picture shows a restoration of the temple.

fighting, so they became the prey of the more warlike savages about them. To protect themselves and their stores of food, they were compelled to build these fortress-homes, high up on the rock walls bordering the scanty streams of this region.

Sometimes niches were dug out of the soft stone to form the rear rooms of these dwellings, sometimes an overhanging rock provided a ready-made roof; more often, the houses were simply built on a ledge and fitted against the flat sides of the cliffs. The material used consisted of carefully selected flat stones laid in cement and sometimes plastered inside and out with clay. Frequently steep stairs cut in the rocks or wooden ladders were the only methods of approach to these primitive fortresses. In the fertile canyon bottoms corn, beans, gourds, and a few vegetables were grown. Traces of reservoirs and irrigation canals have been found, as well as great receptacles for storing grain and water in case of siege.

The cliff dwellers are believed to have been the ancestors of the modern Pueblo Indians (*see* Pueblo Indians), and in all probability their savage foes were the forefathers of the fierce Apaches and Navajos.

Among the most famous of the cliff ruins are those in Mesa Verde Park in southwestern Colorado; in the De Chelly, Del Muerto, and Monument canyons in northeastern Arizona; along the San Juan River in Utah; and along the Chaco in New Mexico—all centering about the common meeting point of these four states. Similar ruins exist in the Sierra Madre Mountains of Mexico.

CLIMATE. The difference between climate and weather, says a small boy quoted by Mark Twain, is that climate lasts all the time and weather only a few days. That comes pretty close to the mark, for the dictionary tells us that climate is the sum of the atmospheric conditions as recorded for a long period of time, while weather is the atmospheric condition at any given time.

The factors that make up climate are the same wherever you are—temperature, moisture, sunshine, and wind. The amounts of each and the way they are combined vary amazingly, however, in different parts of the world.

Temperature, the dominant factor in climate (being the main reason why palms don't thrive in Greenland or polar bears on the Amazon), is also the factor which is distributed over the globe with the nearest approach to regularity. The earth is belted with a hot zone in the middle and wears ice caps on the poles, because the greatest amount of heat is received where the sun's rays fall perpendicularly, as at or near the Equator, and the least amount where they fall with a wide slant and are spread out over a wide area, as at the poles.

But other conditions besides latitude modify temperature. Mount Cotopaxi, almost on the Equator, is capped with snow. The uplands of Ecuador produce wheat and other temperate-zone products. Sunny Italy lies north of equally sunny Tibet, yet Tibet is so high above sea level that its climate is harsh and its nights and winters almost unendurably cold. In general, temperature decreases about one degree Fahrenheit with every 300 feet of ascent above sea level.

Still another factor in determining temperature is situation with reference to water surface and prevailing winds. The sea has a milder and more even climate than the land, because, while the land is a greedy spendthrift of the sun's heat, large bodies of water acquire heat slowly and spend it conservatively. Land near the water—still more, land surrounded by water—has the benefit of this conserving influence, particularly if the prevailing wind is toward shore. Quincy, Ill., is south of Naples, Italy; but it is surrounded by a wide continental plain, while the Italian city has the Mediterranean near at hand, so the Illinois town has a harsher, more uneven climate—a *continental* climate, as it is called. In fact, nearly all of western Europe has a milder, more even climate than most of North America, because the compact

North American continent excludes the ocean influence, while western Europe, largely composed of peninsulas, invites the ocean breezes, and so enjoys an *oceanic* climate.

The Winds and the Water Supply

The moisture factor of climate depends on winds and local topography. Winds may be water-drinkers or water-carriers; and the water-carriers may not drop their loads unless forced by mountains. A cool wind gradually heated in its course, like the Etesian winds that blow from the Mediterranean over the Sahara, develops a raging thirst that parches the land over which it blows. A warm wind laden with moisture from the ocean, on the other hand, will deliver most of its load on reaching a mountain, being cooled by expansion as it rises, and thereby causing the condensation of the vapor it carries. Such are the winds that bring the winter rains on the Pacific coast. Heavy rainfall or snowfall marks the windward side of high mountains, while the other sides are often regions of comparative drouth (*see* Winds).

Sunshine in its full intensity follows the sun's track, of course; yet tropical regions bordering on the sea have comparatively little sunshine during their rainy seasons. Only over inland deserts are tropical skies cloudless. There is a greater amount of sunshine, in general, toward the Equator than toward the poles, in the interiors of continents than on the coasts, and in summer than in winter. Yet the longer summer day, which enables Alaska to raise wheat and strawberries, to some degree compensates the poleward regions for their lesser amount of total sunshine.

The Ups and Downs of the Thermometer

Variability is an extremely important aspect of climate. It makes all the difference in the world whether you get your allotted heat, moisture, sunshine, and wind all in one dose, so to speak, or spread out evenly through the day and the year. Take temperature; the warmest month in Quito, Ecuador, is only one degree warmer than the coolest; but the warmest month in Yakutsk, northern Siberia, is 100 degrees warmer than the coldest. As for moisture, the greater part of the United States receives rain (or snow when it is too cold for rain) throughout the year, but the greater part of India takes practically all its rain during the months of the summer monsoon.

We have certain broad classifications for climate. The maps in which the globe is neatly belted with torrid, temperate, and frigid zones bounded by parallels of latitude, however, do not correspond to climatic facts, for the heat equator strays far north of the geographic equator, and the annual *isotherms* (or lines showing how far the same average temperature prevails) play leapfrog all around the parallels of latitude. Moreover, the so-called temperate zone is very seldom really temperate, but a region of great variability. If we call our main climatic belts tropical, subtropical, intermediate, cold, and polar, perhaps we shall come as near to accuracy as a broad classification can, particularly if we remember that annual isotherms and not parallels of latitude are the boundaries, and that mountains, continents, oceans, and lesser variations of surface introduce endless climatic variations within each climatic belt.

Human beings manage to get along with varying degrees of success in almost every variety of climate except that of the polar regions; but most animals and plants are less adaptable. Hot and moist climates produce the luxuriant tropical forests with their elephants, monkeys, cockatoos, and myriad other forms of wild life; they give us coffee, sugar, pepper, bananas, etc. Hot and dry climates produce the cactus, agave, date palm, etc. Tea, rice, cotton, wheat, corn, olives, figs, grapes, etc., are products of climates furnishing moderate heat and moisture, though some require and some shun high summer temperatures, and some tolerate and others perish in low winter temperatures. Regions with summers ranging from 50° to 72° Fahrenheit produce hardy grains and the fruits which are most tolerant of cold. The polar zones produce little plant life beyond mosses and lichens.

There have been tremendous changes in the earth's climate within the vast intervals of time known as geological ages, accompanying the advances and recessions of the ice-sheets which have at times covered large areas of the earth's surface (*see* Geology; Ice Age). Within the period of recorded history too it seems certain that man has brought about local modifications in climate by the destruction of forests and by irrigation. But most scientists do not believe that within that period there have been any considerable variations in the earth's climate as a whole, though there are evidences—such as the varying thickness of the rings of ancient sequoia trees—which support the theory that there have been long alternating cycles of drouth and moisture.

CLIVE (*klīv*), **ROBERT** (1725–1774). At the age of 18 Robert Clive, who had shown himself so idle, boisterous, and unruly at school as to be the bane of his teachers and the despair of his friends, was sent from his home in England to India to be a "writer" or clerk in the employ of the East India Company. At the age of 42, when he finally left India, he had proved himself a "heaven-born general" whose fame was spread through two hemispheres, for he had won for the British race the richest, if not the first, great imperial dominion of their far-flung empire.

But success had not come to him at once, or without hard work. At Madras he was for a time so lonely and bored by his uncongenial work that he twice unsuccessfully snapped a pistol at his head. Better thoughts followed, and he used his leisure to make up for his neglected schooling by reading the books in the governor's library. When the French attacked and captured Madras in 1746, in the attempt to drive the British from India, Clive sought to find more congenial employment by obtaining a commission as an ensign in the military forces of the Company. But a patched-up peace with the French was soon made, and Clive for a time went back to his hated accounts.

Five years later came his first opportunity to distinguish himself. French and English were again in arms, arrayed on opposite sides in one of the petty native wars which distracted India. With a handful of men, part Europeans and part Sepoys or native troops, Clive seized the unguarded fort of Arcot during a terrific storm of thunder and lightning. For eleven weeks he withstood all attacks. So enthusiastic were his Sepoys that, when provisions ran low, they offered to live on the water in which the rice was boiled, leaving the grain to Clive and his companions. In the end the French and their allies were forced to give up the contest, leaving this rich district to the ruler, who favored the English.

This young soldier-clerk, without any military training, proved himself an able and courageous officer in other battles. Clive returned to England in 1753. When he was presented with a diamond-hilted sword for his services, he refused to accept until another sword was presented to his old superior, Major Lawence, who had given him his first chance.

THE MAN WHO WON INDIA FOR ENGLAND

This is Baron Clive of Plassey, who, beginning as a mere clerk without any military training, won for England one of the richest portions of her wide empire.

Clive was now created lieutenant-colonel, and returned to India to take further measures for the protection and increase of the Company's trade. He defeated the pirates at Bombay, and began to improve the army, for the situation in Bengal was critical. The Mogul empire was decaying and the country faced anarchy. Bengal, with its rich seaport Calcutta, where the English were now established, excited the envy of both the French and neighboring Indian rulers. A powerful prince, Suraj-ud-Dowlah, captured Calcutta in 1756, and cast his English captives into the dungeon known as the Black Hole of Calcutta, where five-sixths of them died before morning. In 1757 Clive defeated this cruel ruler at the battle of Plassey, though he had less than 2,000 men against an army of 34,000, equipped with 40 cannons and 50 elephants. This battle marked the turning point in the English fortunes and insured their position in all India, as well as in Bengal.

In securing the deposition of the defeated Suraj-ud-Dowlah, Clive resorted to some very questionable steps. The grateful Mir Jaffa, whom he seated on the throne, opened the treasury and begged Clive to help himself. Clive accepted a gift of $800,000, and when Mir Jaffa died was left lands with a yearly revenue of $135,000. Another gift of $350,000 Clive devoted to the wives and orphans of English soldiers in India. He improved the army discipline and tried to stop the evils of private trading which had corrupted the Company's employees.

Clive left India in 1767, with the English interests there safe and prosperous. In reward for his services he was made a baron in the peerage of Ireland. He was attacked, however, by many jealous officers of the company and their friends, for they resented his attitude that put an end to the plunder of the vast districts in which the influence of the East India Company was supreme. Clive had to defend in Parliament the wealth which he himself had amassed, against men who were far more corrupt than himself. He boldly and frankly defended his acts, and when telling Parliament how Mir Jaffa had invited him to take all he wanted from the treasury, he remarked: "At this moment I stand astonished at my own moderation."

The result of the attack on Clive was a vindication. Parliament passed a motion declaring "that Robert, Lord Clive, did render great and meritorious service to his country." In referring to the event, however, Clive himself said: "I have been examined more like a sheep-stealer than a member of this House."

Clive was both a great general and administrator. A recent English writer says that if Lord North had sent him instead of Burgoyne to America, the War of Independence might have ended differently. When someone was telling Dr. Samuel Johnson of Clive's great gifts, his wealth, generosity, and genius, he remarked sadly: "And yet that man cut his own throat!" The climate of India, Clive's labors and hardships, together with the bitter attacks upon him —all these so affected his health and mind that he committed suicide in 1774. He was regretted by a host of friends and admirers, and is now regarded as the chief founder of the British Empire in India.

MACHINES *that* MEASURE TIME

"WHAT time is it?" you ask. Centuries of scientific progress, with vast labor and years of patient study, have been necessary to answer that question correctly. Go back through the factory where the little ticking watch is made—trace the history of those tiny wheels, of those measurements so delicate that the naked eye cannot follow them. You'll find that men had to delve into the intricacies of mathematics, the mysteries of astronomy, the wonders of physics and chemistry, before they could force the hands on the dial to tell you when to start for school or to catch your train. The vast sweep of the earth's whirling journey around the sun had to be measured before those ticks could be spaced to mark off an accurate second. As you look at a clock, remember that every time the minute hand passes from one of its marks to the next, it shows that this huge globe on which we live has covered more than 1,000 miles of its headlong journey. Now read how clocks and watches were invented and how they are made today.

CLOCKS AND WATCHES. At first men had no way of measuring time by day except by the position of the sun in the sky and the shadows it cast, and by night they could only guess from the position of the stars. This was of course a very rough-and-ready method, and did not mark time out into such exact intervals as we have in the hour, minute, and second. For ordinary purposes even the highly civilized Greeks of the age of Pericles usually indicated time by only such vague terms as "dawn," "full market," "noon," and "sunset." The ancient Babylonians were the first to hit on a sharper way of measuring time, by making "sundials." They stood an upright rod so that it cast its moving shadow on a smooth surface marked off into equal intervals, roughly equivalent to our hours. The Greeks used this instrument when they needed sharper divisions of the day, and it remained the most general time-measuring device down to the 14th and 15th centuries of our era.

But sundials can only tell time when the sun is shining. A more reliable kind of clock was invented by the Egyptians, and copied by the Greeks and Romans. This clock, known as the "clepsydra" or water-clock, marked off the hours by the dripping of water through a tiny hole in the bottom of a jar. As the surface of the water lowered, marks came into sight which told the hours—or a receptacle below was filled, or the weight of the water was used to operate a pointer traveling around a dial.

In the Middle Ages the "hour-glass" or "sand-glass" came into use. In this instrument sand runs from one hollow glass cone to another through a tiny hole in the center, the quantity of sand being carefully measured out to take just an hour or a certain part of an hour to run from one compartment to the other. Hour-glasses were often used in churches during the 17th and 18th centuries to mark the length of the sermon. Smaller sand-glasses, taking three minutes to run out, are still used in some districts for marking the time for boiling eggs.

A CLOCK THAT UNDERSTANDS ASTRONOMY

This clock shows how the earth revolves on its axis, how it moves around the sun, keeps track of the seasons, and even foretells eclipses!

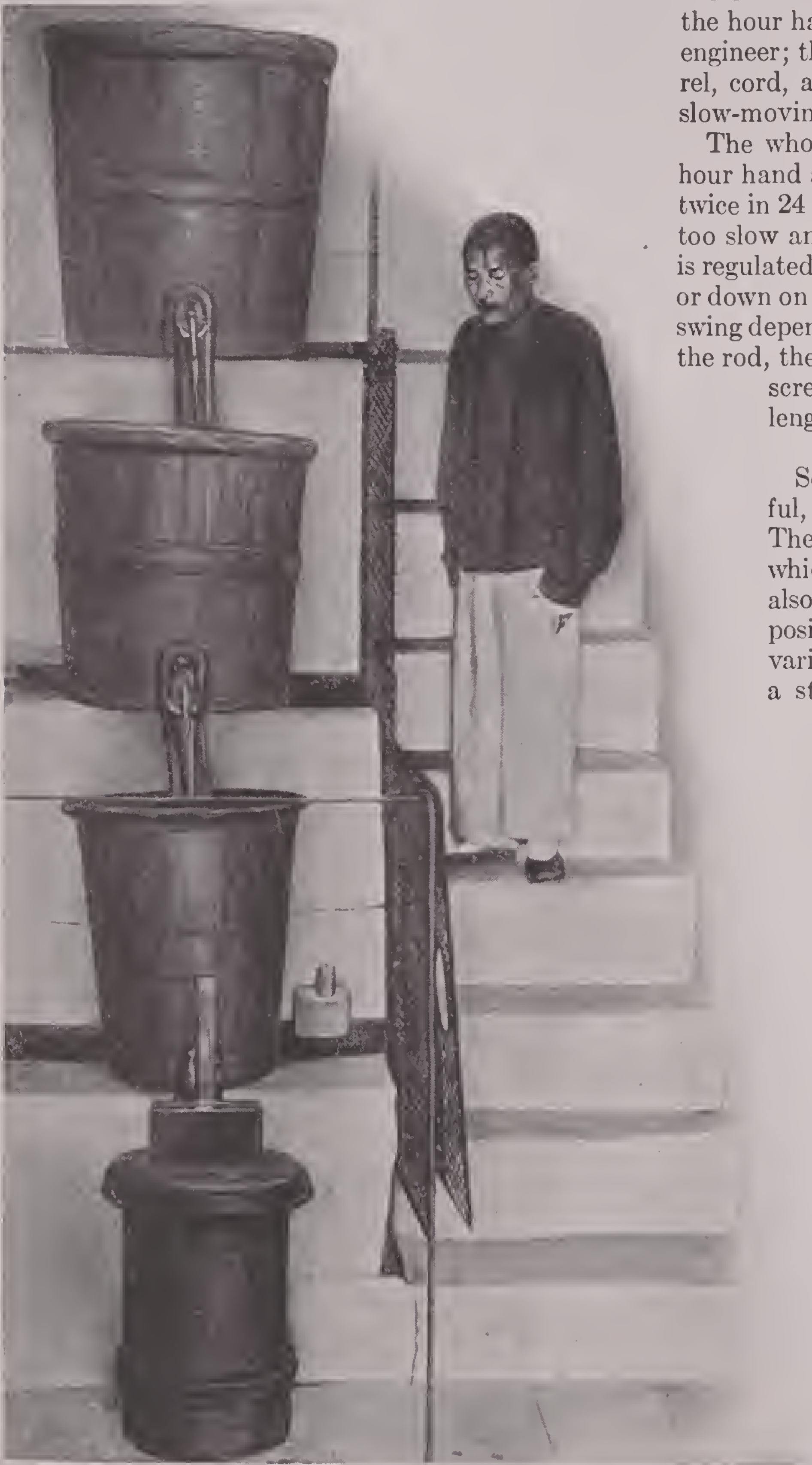
Some time during the Middle Ages, no one knows just when, a form of clock which is still in common use was invented—the form in which a weight, attached to a cord or chain, turns a set of geared wheels which operate a pointer traveling around a dial, as in our "grandfather's clocks." Various devices were invented to regulate the speed at which the weight falls, but the best and simplest device, the pendulum, did not come into use until after Galileo in the 17th century had discovered that the successive small vibrations of a pendulum are made in equal times (*see* Galileo; Pendulum).

In olden times people didn't have to catch trains, and life was far less complicated; so minutes were not very important, and some of the early clocks had no face at all—the bell at the end of the hour was the only means of knowing what time it was. Indeed, the word "clock" comes from the French word *cloche*, meaning "bell."

To understand how clocks are operated let us study the mechanism of a "grandfather's clock." In plain sight are the weight, which furnishes the power, and the pendulum, which regulates the speed. Up behind the dial is a Chinese puzzle of wheels. The pendulum rod is hung by a thin spring of steel that bends easily and allows the pendulum to swing just so far and then gives it a slight push back. The cord or chain to which the weight is hung is wrapped around and around a drum or barrel, like a rope on a windlass. But the barrel cannot move until the pendulum is set swinging. Start the pendulum and the whole clock wakes up, like the palace in the story of 'Sleeping Beauty'.

Attached to one end of the barrel is a cogged wheel, and attached to the pendulum is an anchor-shaped piece of metal with its two points shaped so they can catch in the teeth of that wheel. As the pendulum swings, the "anchor" or lever-catch rocks up and down; the point on one side lets go of a tooth of the wheel, but just as soon as it has turned forward one cog, the point on the other side catches the wheel again. It is this constant catching and letting go which makes the ticking sound. Every time this happens, the pendulum is given a little push which keeps it swinging.

THE WATER CLOCK OF CANTON



This is a monster hour-glass, 500 years old, in Canton, China. The water drips slowly from one copper jar to the next, and in the lowest a float marks on a scale its gradual rise. This clock, you see, instead of saying "tick, tick, tick," says "drip, drip, drip!"

The other wheels of the clock are geared to the barrel wheel and are made of such size that they run at different speeds—one turning the second hand (if there is one), another the minute hand, and another the hour hand. The pendulum you might say is the engineer; the lever-catch is the throttle; and the barrel, cord, and weight furnish the power to drive the slow-moving engine.

The whole duty of the clock-work is to drive the hour hand at a regular rate of travel around the dial, twice in 24 hours. Sometimes a clock goes too fast or too slow and must be regulated. A pendulum clock is regulated by pushing the "bob" of the pendulum up or down on the rod. The time it takes a pendulum to swing depends upon the length of the rod. The longer the rod, the slower the beat; so if the clock is fast, we screw the bob down, and thus increase the length of the pendulum.

Curious Members of the Clock Family

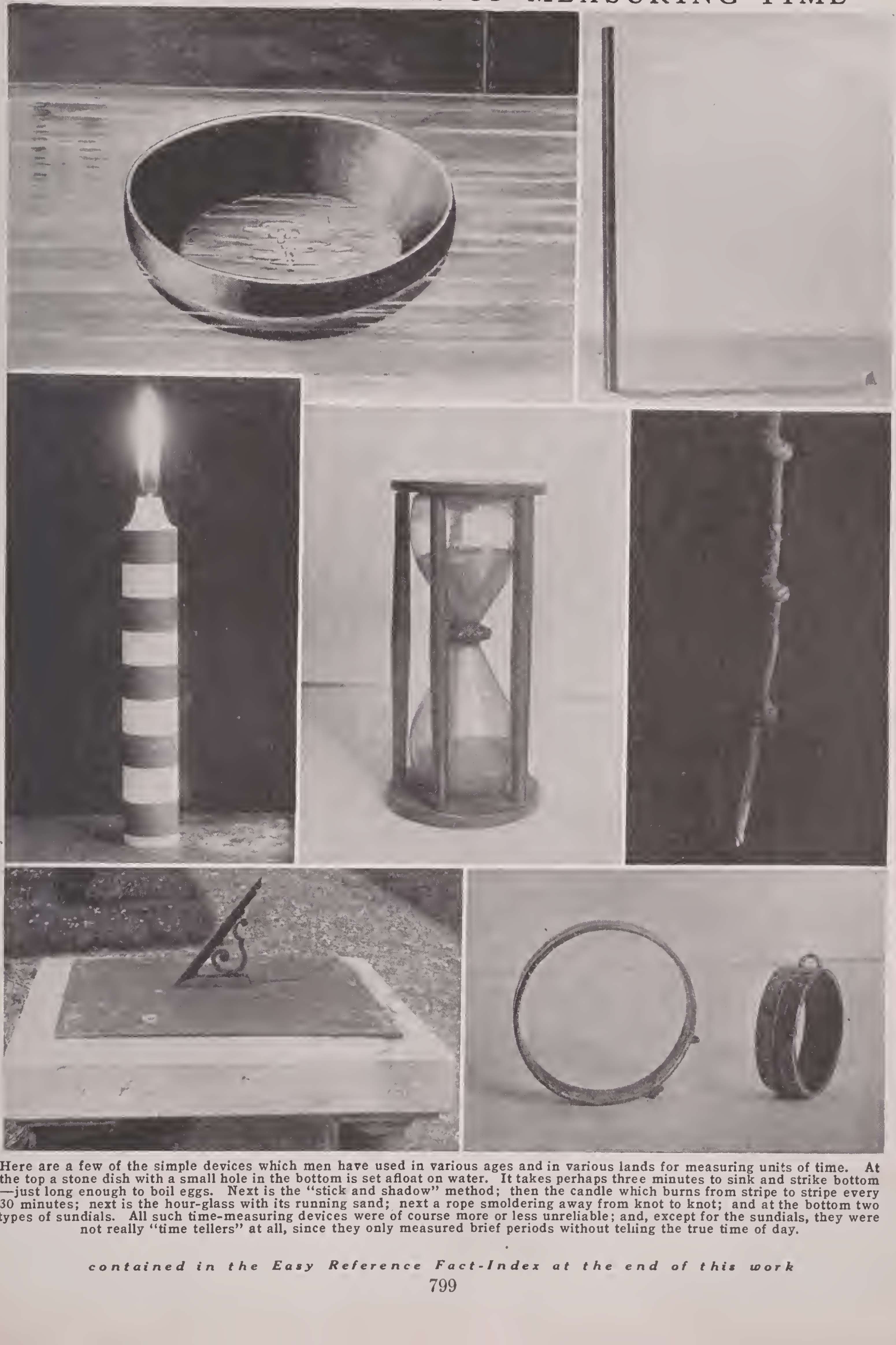
Some of the early clocks were very wonderful, indeed, and it took years to make them. There is a famous old clock at Strasbourg which not only tells the time of day, but also the day of the week, the month, and the position of the moon and the planets. At various times processions of tiny figures cross a stage, including a cock that crows. The day of the week is indicated by a separate little figure that takes its place on a tiny platform. Another of these remarkable performing clocks can still be seen in the city of Munich, Germany.

A clock in Venice has two bronze giants that strike a bell on the hours. Other clocks had figures that appeared and danced to a strain of music each hour. Cuckoo clocks, from which a little wooden bird pops out, sounding the hours, are quite common today.

The largest clock in the United States was built for the Colgate factory in Jersey City in 1908. The two hands weigh together more than half a ton, and the great 400-pound pendulum is kept going by a little gravity arm that falls against it. Its dial is nearly 40 feet in diameter and can easily be read at a distance of three miles. The tip of the minute hand, which is 19 feet long, travels 23 inches every minute, or more than one-half mile a day.

It was obviously impossible to make small clocks or watches, so long as the weight and pendulum were the only methods of furnishing and regulating

SOME STRANGE WAYS OF MEASURING TIME

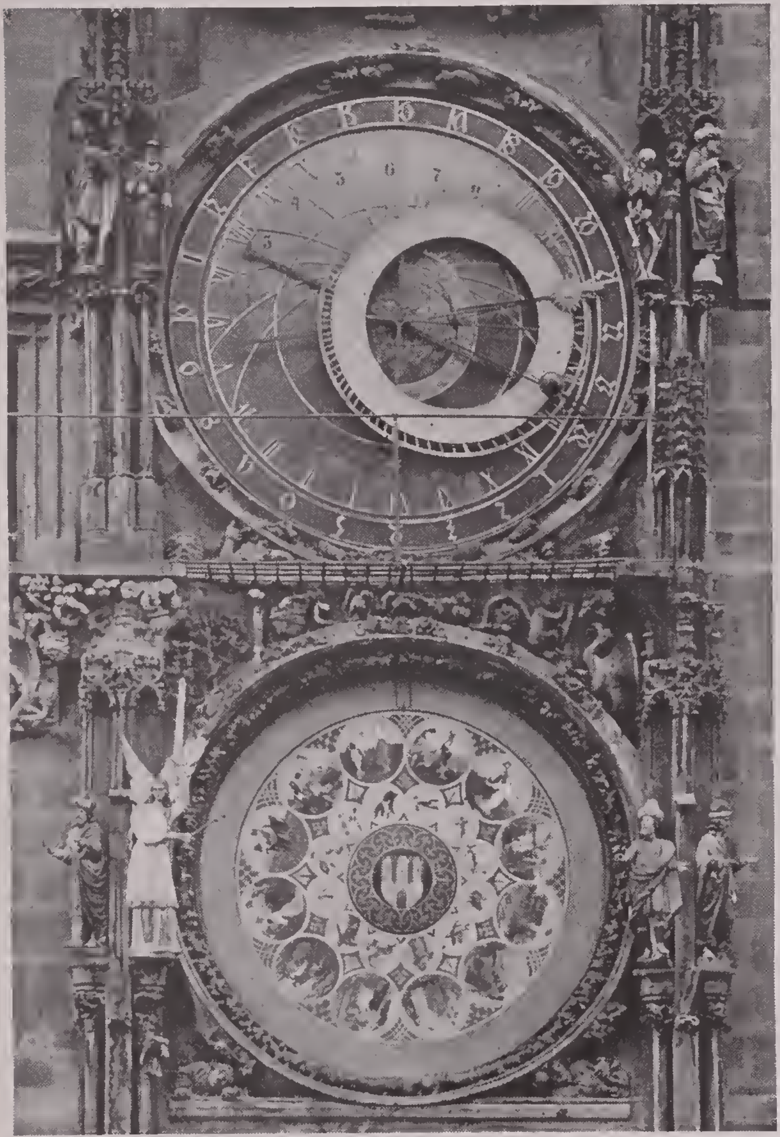


Here are a few of the simple devices which men have used in various ages and in various lands for measuring units of time. At the top a stone dish with a small hole in the bottom is set afloat on water. It takes perhaps three minutes to sink and strike bottom —just long enough to boil eggs. Next is the "stick and shadow" method; then the candle which burns from stripe to stripe every 30 minutes; next is the hour-glass with its running sand; next a rope smoldering away from knot to knot; and at the bottom two types of sundials. All such time-measuring devices were of course more or less unreliable; and, except for the sundials, they were not really "time tellers" at all, since they only measured brief periods without telling the true time of day.

the power. Small clocks and watches are made possible by the use of a coiled spring to furnish power, and a balance wheel to time the speed. The first clocks small enough to be carried about were made in Germany about the end of the 15th century.

If you open the back of a watch, you will see a fussy little wheel turning back and forth rapidly, while a tiny hair-spring contracts and expands. This is the balance wheel, which takes the place of the pendulum. If you look closely you will see near by a small wheel with hook-shaped cogs, which is turning around quite fast; this takes the place of the barrel cogwheel of the grandfather clock. Those little hooks catch in a tiny rocker fastened to the balance wheel, just as the lever-catch did in the clock; and, as they strike that rocker, they give it a little "kick," which swings the balance wheel around, tightening the hair-spring. Then the tension on the hair-spring swings the balance wheel back again, another little hook is released, and the next hook strikes the rocker—and so on.

ANOTHER KNOWING OLD CLOCK



This old clock at Prague, in Czecho-Slovakia, not only tells the time of day, but the time of year and the position of the heavenly bodies. The figures at the sides go through pantomimes at certain hours just as do those of the famous Strasbourg clock.

In most watches there is a little pointer over the balance wheel, which can be moved back and forth between the letters "F" and "S" engraved on its metal support. When you move it toward "F," you tighten the hair-spring which gives the balance wheel a quicker swing and makes the whole watch run faster. When you move it toward "S," the hair-spring is loosened, and the watch runs slower. Great care must be used in regulating a watch in this way, for the parts are exceedingly delicate and sensitive.

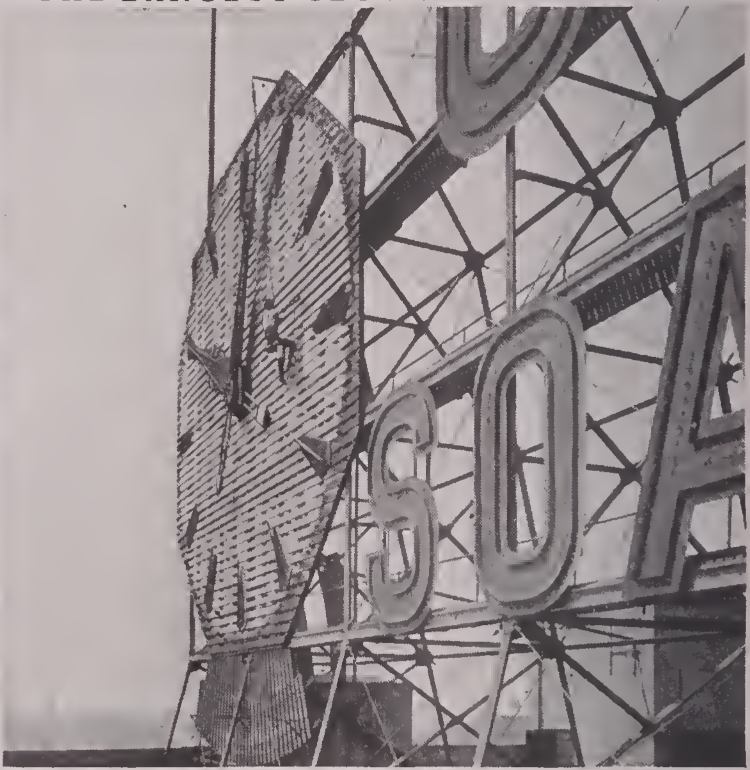
Small clocks operate on the same principle as watches. Alarm clocks are equipped with an extra spring attached to a bell, and are set off with a trigger which is pulled when a certain wheel, moving 12 times slower than the hour hand, reaches the set point.

A watch is perhaps the most wonderful little machine in the world. Packed away in a case sometimes no bigger around than a 25-cent piece and less than a quarter of an inch thick, are from 150 to 800 separate parts. There are wheels of many sizes and shapes, pinions, plates, screws, rivets, pins, springs, and "jewels"—the latter used as durable bearings for the watch pivots. Many of these parts are so small that watchmakers have to pick them up with tweezers or magnets, and find the places for them with the aid of a magnifying glass held in one eye.

Big Machines that Make the Little Ones

For a long time watches were made entirely by hand, and they were so expensive that only the rich could afford them, and if one of the little parts broke, what trouble and expense there was in getting another part to fit! These early watches were often big clumsy things that were almost too large for the pocket.

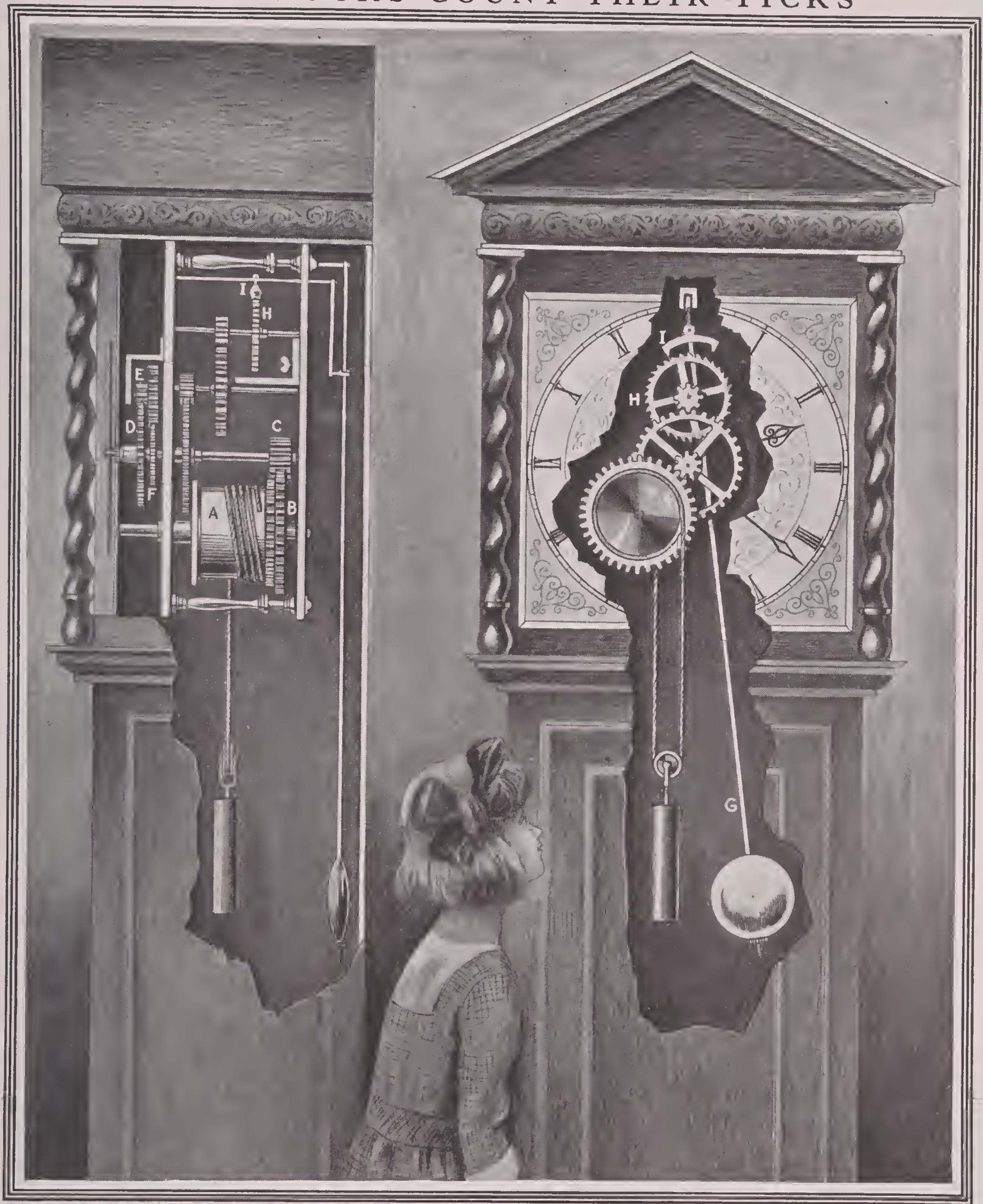
THE LARGEST CLOCK IN THE WORLD



This clock, which is used to advertise a famous brand of soap, stands in Jersey City. It measures 38 feet across its face. The minute hand projects 19 feet from the center, and weighs 640 pounds. In the course of a day, the tip of this hand covers more than half a mile.

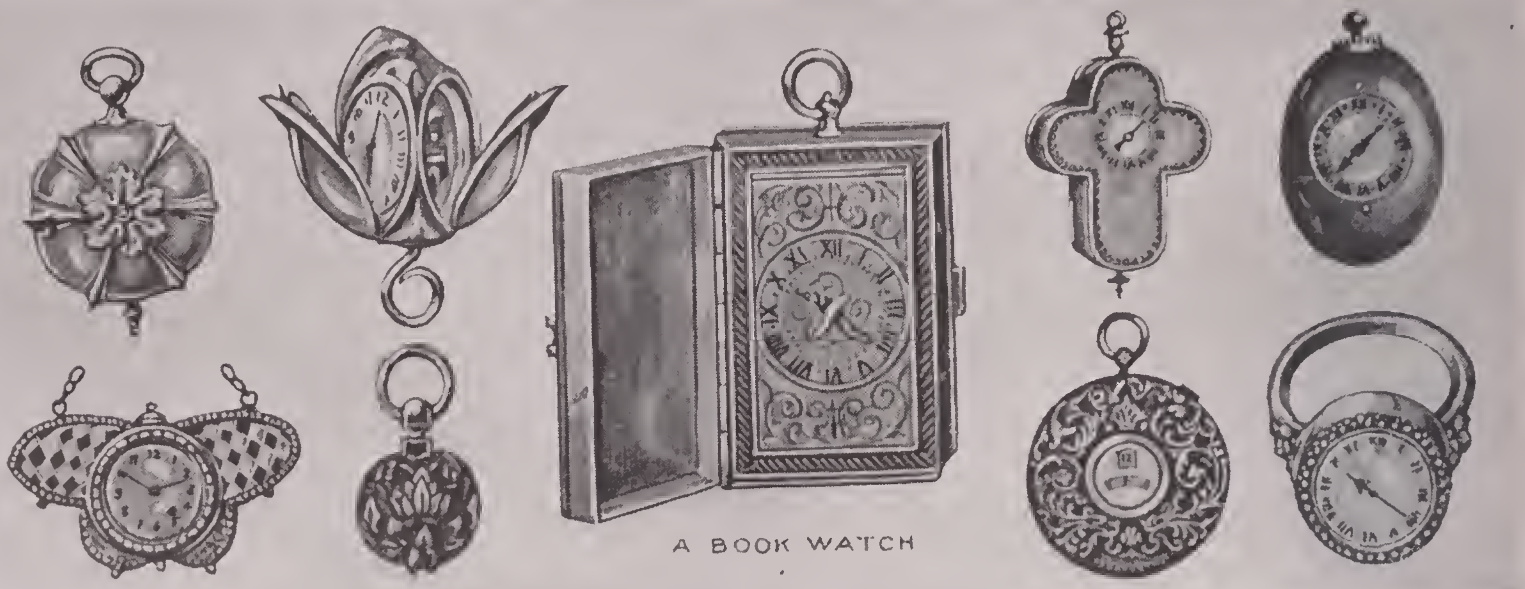
But now machines, most of them invented in America, make watch parts in such quantities and so cheaply that a dollar or two will buy a small neat

HOW CLOCKS COUNT THEIR TICKS



The famous "tick, tock" of Grandfather's clock isn't mere idle chatter, by any means. What the clock is really doing all the time is counting the strokes of the pendulum, and it is the swing of the pendulum (G) that makes the tick by causing the anchor (I) to stop the wheel (H) just so often and just so long with every swing. It is as if the anchor said to the wheel each time, "Stop a moment while I put that down—now go on!" The whole train of wheels (shown in side view at the left) is set going by the turning of the drum (A), moved by the weight; then B turns C, which passes the motion on to D, then it goes from D to E, then to F. Owing to the different sizes of these wheels, the minute and hour hands that record their rate of movement on the clock's face turn at different rates. If B has 64 teeth, for example, and C has only 8 teeth, it follows that C must turn eight times while B is turning once. The minute hand is fastened to the end of a rod which is turned directly by the wheel F. Over that rod fits a tube which carries the hour hand. This tube is fastened to the wheel D, which, on account of the intervening gears, turns only $\frac{1}{60}$th as fast as F. The other wheels at the top act as brakes, governed by the anchor and pendulum. At the same time they transfer to the pendulum the "kick" that keeps it swinging. Psychologists tell us that the clock really says "tick, tick," all the time, and not "tick, tock"; but that the mind, which instinctively dislikes monotony, makes two different sounds of it.

MAKING A PET OF THE WATCH



Watches are so small, so friendly,—snuggling in your vest pocket or hanging about your neck, that it isn't strange that they have been made pets of and dressed up in all sorts of quaint forms. And this has been done for a long time. The oval watch at the right, for example, belonged to Oliver Cromwell and the ring watch once adorned the royal finger of George III.

watch which will keep good time for quite a long while. And each part is so standardized and made with such accuracy that it will fit into any watch of the same kind. It is largely through American ingenuity in devising the wonderful machines which make these standardized parts that watches have been put within the reach of all—rich and poor alike.

A WORLD TIME CLOCK

The globe is turned by clock-work and tells what time it is at any given moment in any part of the world.

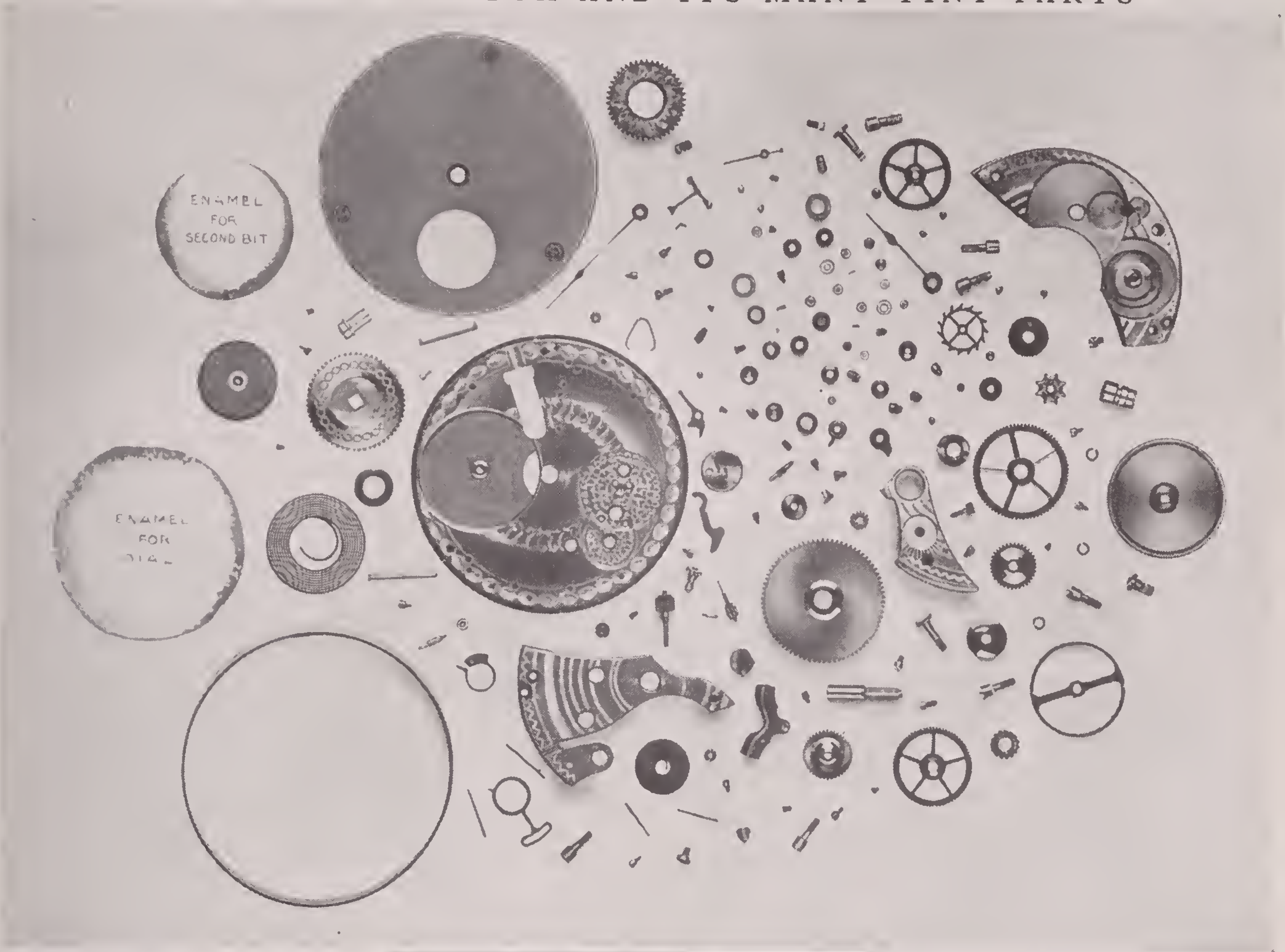
But while machines make all the parts, a skilled watchmaker has to assemble them and fit them together; for no machine has been invented which will take the place of human hands in this complicated task. It is one of the marvels of human skill to see the speed with which a good watchmaker can fit together the tiny wheels and screws.

When you visit a watch factory the first things you see are little whirling tables, rows and rows of them, connected by belts with flying pulley wheels overhead. These are lathes, to cut threads on the outside of screws and the inside of screw-holes. Other machines stamp out the round skeleton "blanks" from which the wheels are made. Holes are drilled in the middle of the wheels and a number of them are strung on a rod like beads on a string. Then the rod is clamped into a lathe. The operator slips a belt over the wheel —*whir-r-r*, how it hums! A steel chisel cuts a row of teeth up and down in all the blanks at once. *Click!* the rod turns a little, and another tooth is cut.

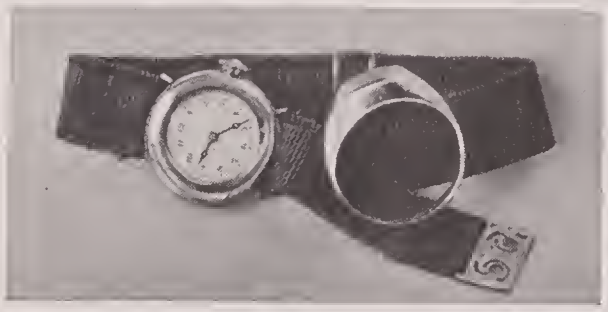
A screw-making lathe clips a tiny bit of brass wire from a coil, whirls it under a chisel to point one end, strikes a blow that flattens the other end into a head, and saws a slot across the head for the screw-driver. Then another chisel cuts a thread-like spiral groove from near the head down to the tapering tip. When it is done some of the smaller screws are not much bigger than grains of sand — hundreds of them can be put into a pill box.

In a watch factory are also big fire-clay ovens or kilns, as there are in potteries, for baking the white enameled dials. Some dials are gilded or plated with gold, but most of them are enameled on copper plates with fine white porcelain. A pattern printed on a fine transfer paper is laid carefully on the dial and pasted smooth. Into the

THE TINIEST WATCH AND ITS MANY TINY PARTS



The picture below shows you one of the smallest watches ever made—smaller, in fact, than an ordinary finger ring. The picture at the top shows the parts of such a watch, much enlarged, of course. There are nearly 300 separate pieces in this picture. When you realize that some of those tiny specks are screws with notches and threads cut into them smoothly and accurately, you appreciate the painstaking skill required of the watchmaker. The mere task of putting these pieces together would seem a hopeless undertaking, yet the experts who do this work show great speed.



oven it goes again. The paper is burned up, but the pattern is burned in!

The most delicate parts of a watch are the springs—the mainspring and the hair-spring. They are tiny ribbons of blue steel, so flexible that they can be coiled up tight, but so strong they can pull the wheels along.

Electricity Used in Clocks

When the development of electricity provided a new form of power, clockmakers were among the first to adapt it to their uses. While there are some clocks which operate entirely by electricity, the ordinary "electric clock" is merely a mechanical clock of the old type, which controls an electric current. This current in turn is used to move and regulate the hands on a distant dial or on several dials at the same time. The thousands of "regulated" clocks you see over the country work on still another principle. Every hour they are set automatically by the master clock, and while they provide their own running power they are wound and controlled by electricity.

The hands of great tower clocks are usually turned by powerful and heavy machinery, so they will not be influenced by wind pressure or the weight of ice and snow. This machinery, however, is controlled by delicate devices, often operating in rooms far below the towers.

Exceedingly delicate little instruments, made to keep time with remarkable precision for use in astronomical observations and for determining latitude and longitude at sea, are called *chronometers*, from the Greek words for "time" and "measure." Chronometers, as well as the finer sorts of watches, are "compensated for temperature"; that is, changes in the period of the balance wheel caused by changes of temperature are corrected by providing weights along the rim which are automatically thrown nearer the axis as the temperature rises. *Chronoscopes* or *chronographs* are instruments of great precision made to record as well as measure minute periods of time. They are used in astronomical observations, in determining the velocity of projectiles, and for similar purposes. One type of chronoscope can register time to the 5,000th part of a second. The familiar "stop-watch," used to time athletic events, registers fourths, fifths, or tenths of a second.

CLOTH. The weaving, felting, or knitting of fibrous material, such as wool, cotton, silk, or linen produces cloth. The manufacturing process consists, briefly, in the tearing down of the original material into fibers, freeing these from dirt and useless material, and building them into the desired fabric. The great variety of cloth fabrics on the market today is the result of the many different fibrous materials, used singly or in different combinations, and the different ways of weaving or putting them together.

The materials used may be classed as animal fibers —wool, silk, and hair; vegetable fibers—cotton, flax, jute, and hemp; and other fibers which have special uses—for example, asbestos, tinsel, gold and other metallic fibers, artificial silk, and spun glass.

Felting and weaving are ancient arts, but the process of knitting does not appear to be more than three or four centuries old. Felting is simply the matting together of the fibers so that they are held by their own roughness or curl. Wool has a rough scaly fiber and thus mats very readily, but it is often mixed with hair or cotton for cheaper felts. The modern mechanical process of felting was invented by an American, J. R. Williams, about 1825. The wool is formed into thin sheets, and a number of these sheets are piled together and pressed between rollers. Thick heavy felts are used for padding and for other purposes. Carpets and table-covers of felt are made in colors and printed with patterns. Felt made from various furs is also used in the manufacture of hats (*see* Hats and Caps).

Weaving had its beginning among primitive peoples in the twisting, braiding, and weaving together of grasses and coarse plant fibers in order to make simple garments, floor mats, and other articles; and the peoples of many different countries have contributed their skill and ingenuity to developing the industry. All woven fabrics have lengthwise threads, called the "warp," as a foundation; and over and under the warp pass the threads of the "weft" (or "woof") (*see* Spinning and Weaving).

Varieties of Woolen Goods

Wool thread or yarn is woven into "woolen goods," such as broadcloths, cashmeres, and beavers; and into "worsted goods," such as merinoes, bombazines, and delaines. These goods take their name from the town of Worsted in eastern England, and they differ from woolens in that the wool fibers have been combed into parallel order before being twisted into the yarn. Trade names for different goods, such as flannel, serge, Panama cloth, Kersey, tweeds, cheviots, and voiles, cannot be depended upon to indicate the quality of the wool or material used in their manufacture; for, with the present manufacturing processes, cotton and cheaper materials are worked in with the wool, silk, and linen, sometimes without affecting the appearance of the goods. The trade names apply to the different weaves and finishing processes used, and vary with the changing styles.

In "velvets," besides the ordinary warp and weft threads, there is an additional weft which is left standing up in little loops, so close together as to hide the regular web. When a piece comes from the loom, the loops are cut evenly so that the ends stand up from the cloth and have the appearance of short fur. When this nap or pile is long, the fabric is called plush. A coarser example of this looping of the extra thread is found in turkish towels. Real velvets are made of silk fiber, the cotton cloth of the same weave being generally known as "velveteen." Other well-known silk fabrics are satin, taffeta, pongee, crêpe de Chine, and sarcenet.

"Damask" is a fabric originally manufactured in the city of Damascus, in Syria, from which it takes its name. It was made of silk and was distinguished by its ornamental woven figures of fruits, flowers, animals, and landscapes. The term is now applied to stuffs made for table-covers, draperies, and furniture coverings which have patterns woven in the loom. Brocade is a similar cloth woven with raised figures.

Linen fabrics are made of the soft silky fiber obtained from the stems of the flax plant. There are cambric and lawn linens, expensive table-cloths of linen, and also the coarser weaves such as the huckaback toweling (*see* Linen).

The Calicoes of Calicut

"Calico" takes its name from Calicut, a seaport of western India. The name was first given to white cotton cloth, but now includes colored cotton cloths that are not sufficiently fine to be classed as "muslins" (named from Mosul, Syria). Calico printing, by which the cloth is given any desired pattern, was at first done by means of wooden blocks pressed upon the cloth by hand; but now great printing presses print rolls of calico cloth much as the colored Sunday supplements of our newspapers are printed. This printing process may also be applied to woolen, worsted, silk, and linen fabrics. Other common cotton cloths are gingham, duck, canvas, dimity, corduroy, and fustian. The last two are woven like ribbed velvet.

Knitted goods somewhat resemble the woven fabrics, but are much more elastic. However, they ravel more easily, since they are made by looping a single thread (as in hand knitting) instead of interweaving warp and woof (*see* Knitting Machines). Knitting was used first for stockings and underwear. "Jersey" cloth, made with an elastic stitch resembling knitting, and "tricolette," a knitted silk cloth, are popular dress fabrics of recent years.

True alpaca cloth is woven from the wool of the South American animal of the same name, but certain light cotton and wool imitations with shiny surfaces are called alpaca in the textile trade. Similarly, the name mohair, which belongs properly to cloth made from the hair of Angora goats, is often given to its domestic imitations.

Cloth making has had in the past an important effect upon history. Many medieval towns owed their prosperity to the jealously guarded secrets of their cloth-makers' gilds, and many a distant land was first visited by traders in search of rare weaves.

SUITS *by the* MILLIONS—HOW AMERICA *is* CLOTHED

The Fourth Greatest Industry in the United States — How Styles are Designed, How the Cloth is Prepared, and How the Garments are Turned out Ready-to-Wear in Wholesale Lots by Marvelous Machines and Skilful Fingers

CLOTHING INDUSTRY. When our remote ancestors started on their migrations from the tropics to the temperate regions, it became necessary to provide warmer clothing than a skin thrown across the shoulders or wrapped around the loins. They required protection from the cold along with freedom of movement; and sufficient clothing still remains one of the first necessities of life for people in northern climates.

From those earliest days until about a half-century ago, the clothing of the vast majority of people was made by hand by the women of the household, for only the wealthy could afford to employ a tailor. So clothing stores, which offer for sale outfits of ready-to-wear clothing for men, women, and children, are of recent origin.

Although the ready-made clothing industry is one of the youngest industries of the United States, it has grown to be one of the largest, ranging fourth among American industries in the value of its products. Much of this development has come about since the beginning of the 20th century. By far the greater number of American people wear factory-made clothes, and only a small proportion of the material is imported. The clothing compares favorably with that made by the custom tailor and is much less expensive. This great industry is peculiarly American, for the factories of Europe are few and small compared with those here.

The making of men's ready-to-wear clothing was begun in 1831 in a very small way, when George Opdyke of New York City, who afterwards became mayor, opened a little establishment with a branch store in New Orleans. His trade was largely with the southern planters, who wanted garments of cheap materials for the slaves on their plantations. Soon merchants in seaport towns began to keep on hand a small stock of rough clothing such as the sailors would require on their voyages.

The Civil War and Ready-Made Clothing

When the Civil War brought with it the necessity of putting a great number of men into uniform, the manufacture of ready-made clothing in quantity began. Clothing factories were started with improved methods and machinery, and the industry became well established in the four years in which these uniforms were needed. After the war the rapid development of the West and increased immigration led to a larger expansion of the industry.

The great advance in the clothing business would not have been possible except for the improved machinery and labor-saving devices of the past several years. The first and greatest impetus it received, of course, was the sewing machine, invented by Elias Howe, in 1846, and important improvements have been patented almost every year. There are now machines for felling, binding, seaming, two-row stitching, hemstitching, blind-stitching, canvas front making, embroidering, button-holing, button sewing, collar and lapel padding, and sleeve inserting. With the exception of cutting out and pressing, practically no hand work is now done on the cheaper garments. These machines are for the most part driven by electricity at a speed which seems unbelievable.

Inventions have also been made to do away with the old slow method of cutting out the material with shears. Now machines carrying sharp knives and electrically operated are used, which can be made to follow a pattern, cutting through many thicknesses of cloth at once. With such a machine a hundred pieces can be prepared in the time consumed in the cutting out of one by the old hand method. For the finer clothing, however, the material is still cut with shears to individual patterns.

"Sweat Shops" and Specialization in the Industry

In the early days of the clothing industry, the work was cut out at the shop and taken by the workmen or workwomen to their homes to be sewed. Following the Civil War a great number of German tailors entered the field, bringing with them the "division of labor" method. The garments were made at the workman's home, the father in many cases doing the machine work, the mother and children assisting with the basting, the buttonhole making, and the finishing. In this way most of the ready-made clothing was made until about 50 years ago. With the great numbers of Russian Jews who then immigrated to this country, the "task system" or "sweat-shop" was introduced. In this system there was usually a team of three men—an operator, a baster, and a finisher—who were aided by a presser and one or more girls who did the finishing work. Each of the three made only his particular part of the garment, and it was possible in this way to turn out a great deal more work than with the older system. The work was obtained from the manufacturer During prosperous times these workmen received reasonable wages; but when times were hard, wages were cut, and the workmen had to work longer hours and turn out almost double the work before they could made a living wage. The many hardships imposed on the workmen and the dirty, insanitary conditions in which they worked and lived made this method very unpopular, and it was forbidden by law in 1892 (*see* Sweat-Shop System). This system, however, was the beginning of specialization in the clothing industry.

THE ARTIST OF CLOTHES

When a young man comes out in all the glory of a new ready-made spring suit, he owes the cut of the garments to the artist in clothes, the designer whom we here see at work. After the designing of a new model, it is "graded," that is, patterns are made to fit wearers of different sizes and builds.

Where Cloth is Changed to Clothes

The factory system, which succeeded it and which is still in use, has grown to immense proportions. The old system of giving out work to "contractors" has more and more been done away with, as the manufacturers now do extensive advertising of their various trademarks, and it is essential that the product be uniform. Most of the work is now done under one roof by labor that the manufacturer directly employs. The work is divided, so that sometimes as many as 36 people work on a single garment. This permits of the employment of less skilled labor, and increases as well as cheapens production. Great buildings have been erected—light, airy, and sanitary—and hundreds of thousands of workmen and women are employed. In 1907 tailor-to-the-trade houses were established where clothing is made from measurements forwarded by merchants, whose customers have selected the material desired from samples.

When the materials are received in these big clothing houses they are delivered to the top floor, and from there they are passed on in the various stages of manufacture from one floor to the next by chutes and elevators, until the finished garment reaches the basement, ready for delivery. On their arrival woolens are examined for defects, are given the all-wool acid test, gone over for durability and fastness of dyes, and put through an elaborate shrinking process. The goods are then dried in a specially constructed room, into which thousands of cubic feet of fresh warm air are pumped every hour. All the materials to be used in the making of a garment are shrunk, so that it will not lose its shape. While the cloth is being cut, the buttons, lining, haircloth, etc., necessary for the garment are also cut or brought together; and, when everything is ready, all the materials are bundled together and sent to the sewing departments. When they are finished they are carefully examined and pressed.

Factory production of women's garments did not begin until after 1870, and at first only cloaks were made. A few years later, however, the manufacture of suits, dresses, waists, and skirts was begun, and the volume of the business has increased until now the value of factory-made clothing for women and girls has surpassed that for men and boys. In former days the working conditions in many of the cloak and suit factories or "lofts" were often exceedingly unsanitary and the wages pitifully low. But today manufacturers generally have remedied these evils. The shops where women's garments are made have about the same conveniences now as the factories for men's clothes. The

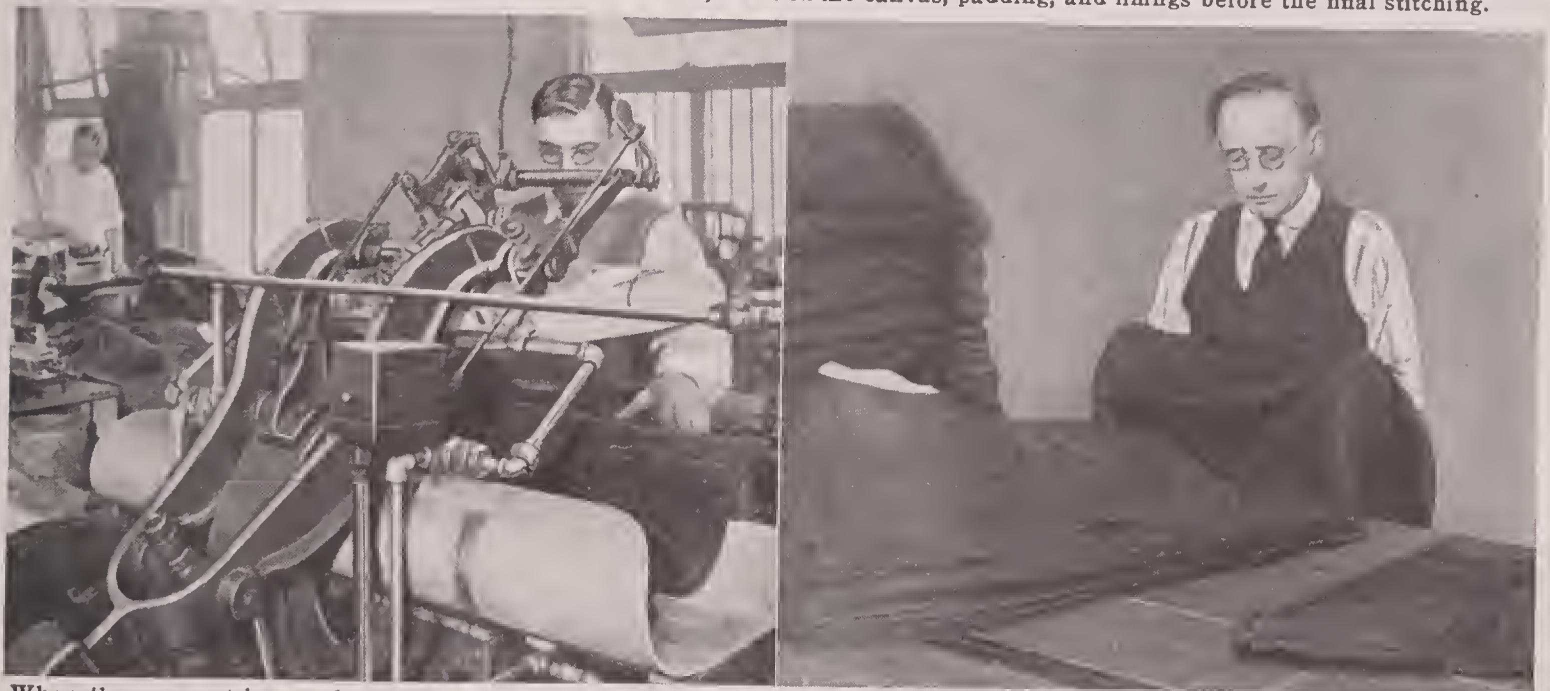
A CUTTER MAKING HIS "LAY"

After the patterns have been made in the designing department, they are passed on to the cutters, one of whom we see here at work making his "lay"—that is, laying out the patterns on the cloth so that it can be cut with the best economy of material. This process is not as easy as it may sound. Not only must the cutter "fit together" the patterns over the cloth, but he sees to it that the "grain" runs right and that the design of the cloth matches at the seams.

THE MANY TAILORS THAT MAKE A MAN

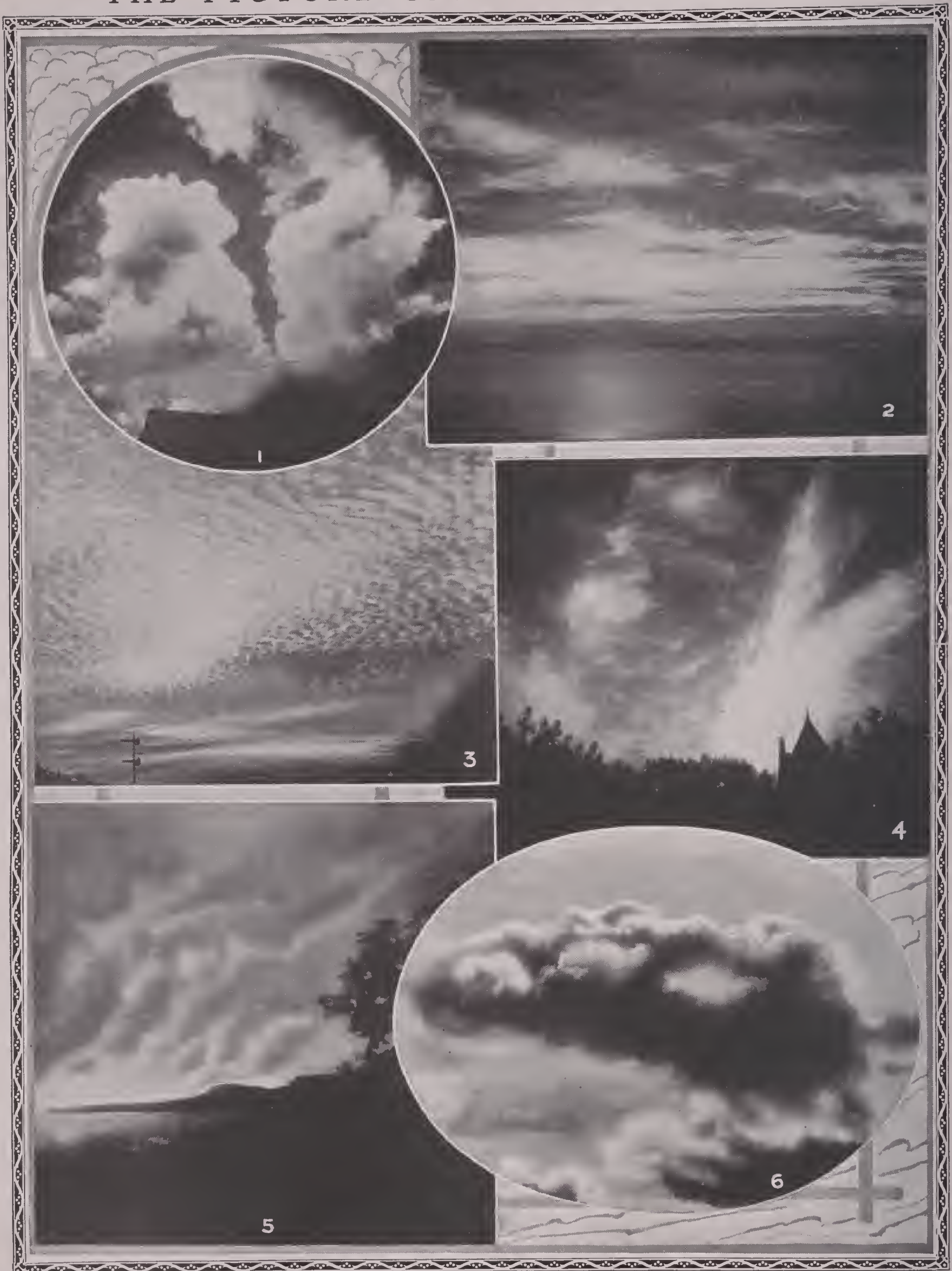
The old saying that "it takes seven tailors to make a man" must be revised today. For in large establishments it takes as many as three dozen separate operations, performed by as many different special workers, to complete a suit of clothes. This picture shows a cutter cutting out the parts of several suits through several thicknesses of cloth at a time, with a sharp wheel operated by electricity.

Rows and rows of operators at machines make pockets, lapels, sleeves, and other parts, and sew them together to form the body of the coat. Hand operators, such as the man shown here, baste in the canvas, padding, and linings before the final stitching.



When the garment is complete except for the buttons, it is pressed on a steam pressing machine and also by hand. After the buttons are added, the completed garments pass to inspectors, like the man on the right, who look them over carefully.

THE PICTURE GALLERY IN THE SKY



While the cloud pictures in the vast gallery of the sky have never been twice exactly alike since the world began, cloud formation does follow certain distinctive types. Here we have examples of (1) Cumulus clouds, (2) Stratus clouds, (3) Cirro-Cumulus clouds, (4) a form of Cirrus and Cirro-Cumulus clouds to which we owe many gorgeous sunset effects, (5) Strato-Cumulus clouds, (6) low-hanging Cumulus clouds before a rain.

models of many of the coats, dresses, and suits for women are brought from Paris.

The greater part of the factory-made clothing is manufactured in New York state, although there are large factories in Chicago, Baltimore, and Philadelphia. There are also many large factories devoted exclusively to the making of shirts, collars, night garments, underwear, and similar articles of wearing apparel for men and women.

CLOUDS. Water vapor, though invisible, is always present in the air. When the air has cooled enough, part of the vapor is condensed into tiny floating globules of liquid water, or crystals of ice or snow. This finely divided but no longer vaporous water we call "fog" or "mist" if it trails on the ground, and "cloud" if it floats high above the surface of the earth. Changeable and insubstantial as they are, clouds possess characteristics which permit classification into broad types.

The upper clouds are composed of snow or ice crystals. Highest of all is the isolated feathery or fibrous cloud called "cirrus," which sometimes spreads in converging bands across the heavens. The "cirro-stratus" is a fine whitish veil of tangled cirrus fibers.

Next come the intermediate clouds. The "cirro-cumulus" is a shadowless or nearly shadowless cloud composed of little fleecy balls, or, in a "mackerel sky," of ribbed wisps. The "alto-cumulus" is a denser shadowed fleecy cloud composed of larger balls. The "alto-stratus" is a thick gray or bluish veil, through which the sun or moon may peer surrounded by a corona or circular band of ghostly lights.

The lower clouds include the "strato-cumulus," a still darker cloud, composed of larger rolls or balls, which sometimes covers the whole sky; and the "nimbus" or the rain-cloud, a dense formless sheet with ragged edges. Any cloud except a high cumulus is called a "nimbus" as soon as it produces rain.

The "cumulus" or "wool-pack cloud" is formed by the condensation of vapor at the summit of a rapidly ascending current of warm air. It has a flat base and domed summit, often torn and tumbled by the wind, making a "fracto-cumulus" cloud. The "cumulo-nimbus" is the thunder-cloud, a towering mountainous mass, generally veiled above with "false cirrus." The "stratus" is merely a lifted horizontal sheet of fog, which may be torn into rags ("fracto-stratus") by wind or mountain peaks.

Many clouds are formed by warm winds blowing over cooler surfaces. As the warm air is forced upward over the barrier of cool air, it expands and part of its water vapor becomes condensed; alto-stratus and cirro-stratus clouds are thus formed. The trailing clouds about mountain peaks are similarly formed when warm winds are forced over the mountain tops. On hot summer days clouds are often formed by rising currents of warm air. As this warm air expands its water vapor becomes condensed into cumulus and cumulo-nimbus clouds. The undulating surfaces of such billowy clouds as the cirro-cumulus, alto-cumulus, and waved alto-stratus are formed by waves of warm wind in the upper atmosphere meeting colder air surfaces above.

CLOVER. The clovers and the bees belong to a mutual benefit society. The clovers furnish tempting sweets for the bees, and the bees in return make the clovers fertile by carrying the pollen from flower to flower. When some of the most important varieties of clover were brought from their ancient home in Asia to Europe and from there to America, they proved to be good immigrants, appearing as much at home in new fields as any of the native vegetation. But when the common red clover was later taken to Australia, it grew and blossomed, but *no seed formed.* Scientists studied the problem and found the reason to be that its special friend the bumble bee had been left behind. Red clover depends entirely upon the bumble bees to carry its pollen, for its nectar is placed where only the long-tongued heavy bumble bees can reach it. White clover and the sweet clovers spread an excellent table for the honey bees, and make the very finest grade of honey.

The clovers are wonder-workers on the farmer's fields. They furnish excellent pasturage, and there are extra profits for the dairymen when their sleek contented cows stand "knee deep in June." The familiar expression "living in clover" well describes a life of luxury and ease. A field of clover may be cut early for hay and again later in the season for seed. Where there is a long favorable growing season a number of cuttings may be taken, the plants shooting up each time without replanting.

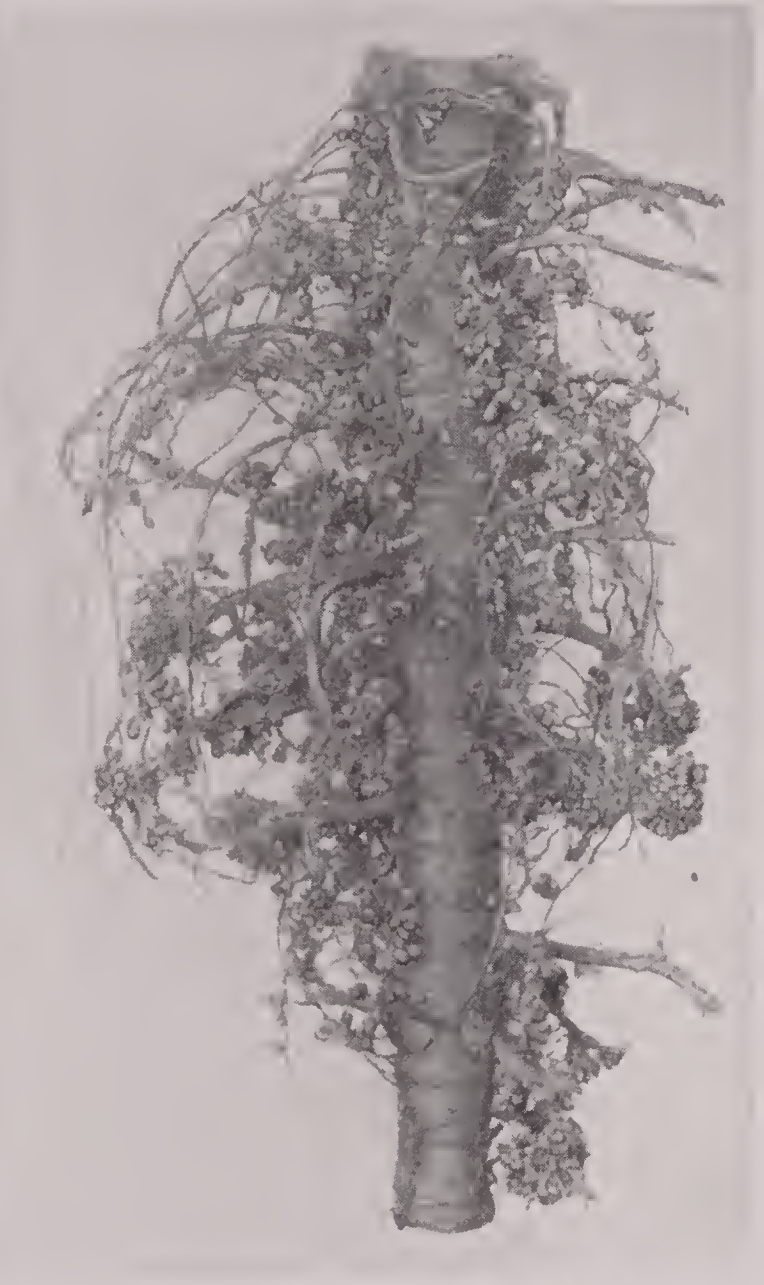
And while these valuable crops are grown, the clovers are actually adding fertility to the soil instead of exhausting it, as most crops do. Grain and root crops draw largely upon the plant foods of the upper layer of soil, but the clovers have a long root system feeding in the deeper layer or subsoil. The valuable plant food thus obtained is added to the soil for the next year's crop when the fleshy clover roots decay, or when clover is turned under for fertilizer.

And more important still, the nitrogen bacteria find a home in the nodules of clover roots, as they do on the roots of all leguminous plants, and gather free nitrogen from the air to add to the plant foods in the soil (*see* Nitrogen). This is the secret of why a good crop of corn grows where clover grew the year before.

The sweet clover, while not one of the true clovers, resembles them in many ways and belongs to the same legume group. It was once looked upon as a rank troublesome weed. Only the beemen claimed it as a friend, but now it is valued by the general farmer. It will grow on land too poor for other crops and in a greater range of soil and climate conditions than the true clovers or alfalfa. It is a great soil builder, because its large fleshy roots reach down 20 feet and more into the ground filling it with nitrogen bacteria.

Over 400 species of clover have been listed. They grow most abundantly in the temperate regions of Europe and America. The common red clover is one of the oldest varieties cultivated. The mammoth red clover is an improved variety of the common red. Alsike or Swedish clover grows on land too wet for red clover and is a good crop for the honey-bees. The white or Dutch clover creeps into the pasture-land and grass plots everywhere. Crimson or Italian clover, which is used as a cover crop in orchards, is also grown by the florist as an ornamental plant because of the graceful beauty of its long crimson heads held on tall slender stems. It is not a heavy forage crop, but its rapidity of growth makes it valuable in certain sections. The Berseem, the yellow-flowered clover of Egypt, has been introduced into the United States to grow on the dry alkali fields of the Southwest.

A FACTORY TOWN ON A CLOVER ROOT



Each of the little lumps on this sweet clover root is a nitrate factory, where colonies of bacteria take nitrogen from the air and other chemicals from the soil, and turn out the natural fertilizer which enriches the soil.

The true clovers belong to a genus of the bean family (*Fabaceae*) called *Trifolium* because the leaves are divided into three leaflets. The flowers—red, white, crimson, or yellow—grow in heads or clusters. Closely related to the true clovers are the sweet clovers (*Melilotus*), bur-clover (*Medicago*), and the Japan clovers (*Lespedeza*). Scientific name of red clover, *Trifolium pratense;* white clover, *Trifolium repens.*

CLOVES. If you were asked what the clove is, what would you say? Undoubtedly you would call it a widely used spice, and you might mention that oil of cloves is used for toothache; but do you know that it grows as a flower? Yet that is what those knobbed sticks are—the flower of the clove tree, a beautiful evergreen from 30 to 40 feet high, which grows in the East and West Indies.

At first the flower buds are a pale color, which gradually turns to green and later to a bright red, when they are collected and dried to a dark brown. Cloves are about half an inch long, with a knob at one end, which contains the unopened petals in the form of a ball. Their general shape, that of a nail with its head, gave them their name, from the French word *clou*, meaning "nail." The oil of cloves, used as a flavoring extract and to ease toothache, is obtained by repeated distillation in water.

Cloves formed one of the important items in the spice trade of the Middle Ages. They grew originally in a small group of islands called the Moluccas, or Spice Islands. The Dutch cultivated the tree in Amboyna, and the French transplanted it to Zanzibar and the West Indies. Scientific name of clove tree, *Eugenia caryophyllata.*

CLO'VIS (465–511). One day this king of the early Franks was engaged in a desperate battle with a neighboring tribe of Teutons. Slowly but surely his warriors were being driven from the field. The old gods Woden and Thor seemed to have failed them. Suddenly Clovis bethought him that his wife Clotilda had long been urging him to become a Christian. Raising his eyes to heaven, he cried:

"Oh, Christ Jesus, I beseech thee for aid! If thou wilt grant me victory over mine enemies, I will believe in thee and be baptized in thy name!"

With this he rallied his men and gained a great victory, and on Christmas Day of the same year (496) the king and 3,000 of his followers were baptized. But Clovis remained at heart the same savage old warrior he had been before, and when the monks told him the story of Christ's crucifixion, he clutched his battle-ax and cried: "If I had been there with my Franks, I would have revenged His wrongs!"

When Clovis at the age of 16 became king of one tribe of the Franks, these ancestors of the modern French nation were a scattered and disunited people with a number of kings. When he died, 30 years later, he had united all the Franks into a single powerful nation under his own rule. He overthrew the Roman power in Gaul in a battle near Soissons in 486, and before his death he had won for his people a kingdom which reached from the Rhine on the north and east almost to the Pyrenees Mountains on the south. So complete was the Frankish conquest that this land ever since has been called France, from their name.

The BLACK DIAMONDS that do the World's Work

The great Northwest of the United States gets most of its coal from Ohio and Pennsylvania in giant barges like these, which bring it from ports on the lower lakes to Duluth. There immense traveling cranes with "clam-shell" scoops operated by electricity work at such speed that a cargo of 6,000 tons can be unloaded in a quarter of a day.

COAL and iron are the bases of modern industry. They enter into every girder and beam of a skyscraper, into every plate and rivet of an ocean liner, into every piece of whirring machinery, into our railroads, street-cars, and automobiles. Coal cooks our food and lights our houses, keeps us warm and weaves our clothing. Indeed, the greatest industrial advance that man has made from his primitive condition has been through the use of coal to make iron his slave. A nation's coal supply measures today that nation's chance for success in the international struggle for industrial supremacy. Nations have gone to war, in fact, for the purpose of obtaining the coal mines of their rivals.

COAL. At the close of George Washington's life, the world was using less than a bushel of coal and three pounds of iron a year for each inhabitant. Just before the World War of 1914–18, every human being, whether South Sea cannibal or American business man, could claim four-fifths of a ton of coal and nearly 90 pounds of iron as his share of the world's annual output. This increase measures the progress we have made since the days of the stagecoach and the spinning-wheel.

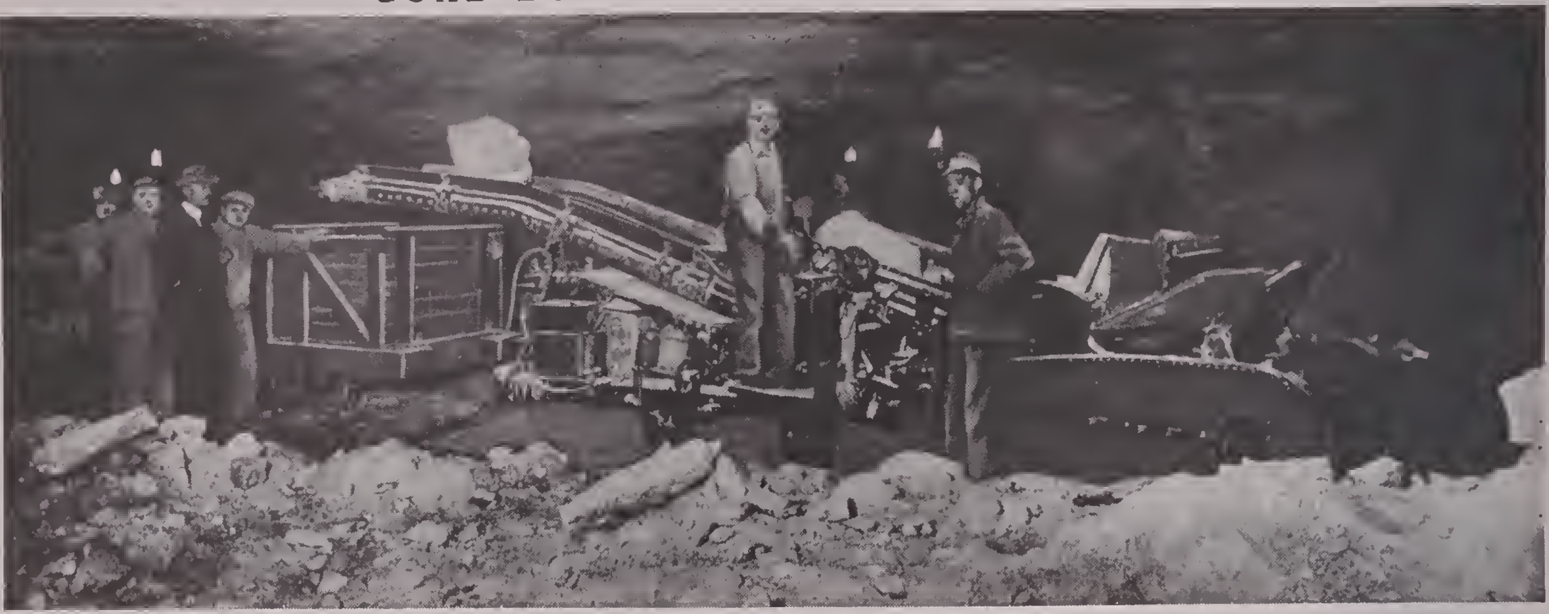
In the United States, coal stands next to the soil in the list of national resources. The United States has more than one-half of the known coal of the world, and if the coal taken from its mines in one year were put into one continuous pile, it would erect a wall as huge as the wall of China around the entire boundary of the country—north, south, east, and west—and the power stored in this coal could lift such a wall 200 miles into the air.

How Wood was Changed to Coal

The substance of coal was alive millions of years ago in the form of vegetation growing in swampy places like the peat-bogs of the present day. As the vegetation died it fell into the mire and water, where it did not decay as it would have done in the open air, but underwent chemical changes. The first series of changes resulted in its transformation into peat. After the accumulation of considerable beds of vegetable matter in the swamps, the surface of the land sank and these peat-bogs became the bottom of seas and lakes. Then sediment, such as sand and mud, was deposited over the accumulated vegetable matter. Thus buried, the vegetable matter was still more completely shut off from the air and underwent further chemical changes. At the same time the weight of the sediment compressed the deposits into more and more compact form. As the result of the chemical changes and the compression, the vegetable matter was gradually brought to the condition of coal.

Some 50 years before Columbus discovered America an Italian scholar who later became Pope Pius II was sent upon a diplomatic mission to England and Scotland. He observed that the people of these countries dug from the ground a "sulphurous stone" which they used for fuel. This is one of the first authentic records of the use of coal, although it had undoubtedly been used as a household convenience long before that time. It did not become an important national resource, even in England, until the middle of the 18th century, when the beginning of the age of

COAL-LOADING MACHINE IN A MINE



This machine picks up the great lumps of coal with scoops like road-scrapers attached to an endless chain. These scrapers deliver the big lumps to a moving platform which carries them up a shoot and drops them in the car. These lumps of coal look white because of the glare of light from their shiny sides.

machinery gave coal a new importance in the smelting of iron for making machinery. Coal-mining then developed as an industry.

The value of coal extends far beyond its use as fuel. Illuminating gas, coke, and coal-tar are produced from it; and out of coal-tar thousands of chemicals are manufactured—valuable medicines, explosives, fertilizers, and, most surprising of all, the hundreds of bright-colored dyes used to color our garments, household draperies, and Easter eggs. (*See* Coal-Tar Products.)

How Hard and Soft Coal Differ

When the changes have gone so far that the proportion of carbon in the coal is as great as 90 per cent, the coal is "anthracite," or hard coal. When the proportion of carbon is 80 to 85 per cent, it is "semi-anthracite." "Bituminous" or soft coal, the commonest kind, has from 60 to 70 per cent of carbon; there are several varieties of soft coal. In the western part of the United States (Colorado, Wyoming, the Dakotas, Washington, etc.), and in many other parts of the world, there are large quantities of imperfectly carbonized vegetable matter midway between peat and true coal, known as "lignite."

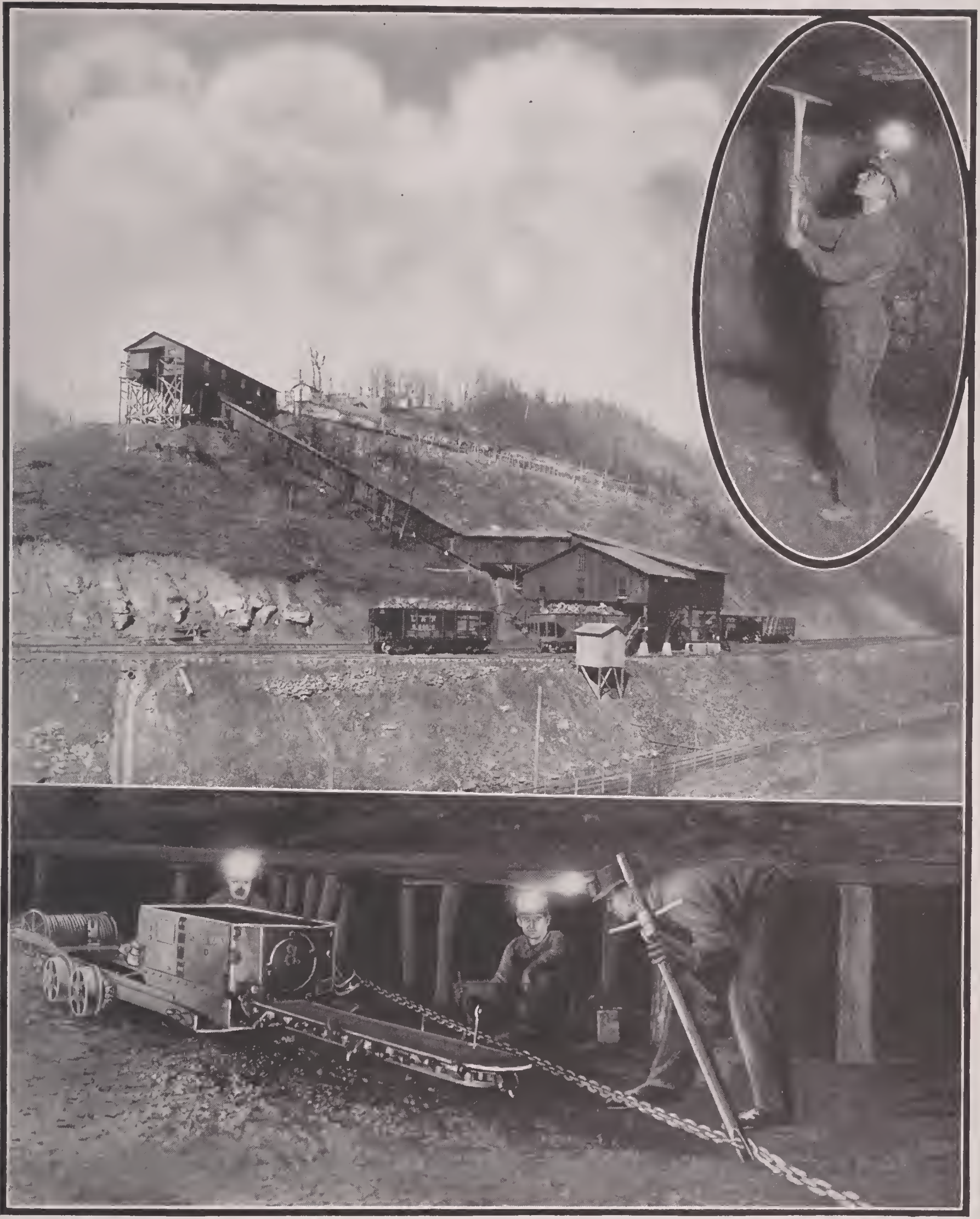
Anthracite coal occurs mainly where the deposit has been subjected to the pressure and heat caused by the folding of the rock strata. In the United States it is found chiefly in eastern Pennsylvania, although there is some in Colorado, where soft coal has been changed by contact with lava. Pennsylvania leads also in the production of soft coal. Large coal fields are found also in Ohio, Maryland, West Virginia, Michigan, Illinois, Kentucky, Iowa, Missouri, Kansas, Arkansas, Oklahoma, and Texas.

A COAL CAR COMING OUT OF THE MINE

From the mines underground, the coal cars are brought to the surface on "hoists," or elevators. From the hoists they pass to the track that leads to the coal bins.

The chief coal deposits of the world are in North America, Europe, and Asia. The coal fields of South America, so far as is now known, are small and scattered, and are little worked except in Chile and Argentina; but South Africa, Australia, and New

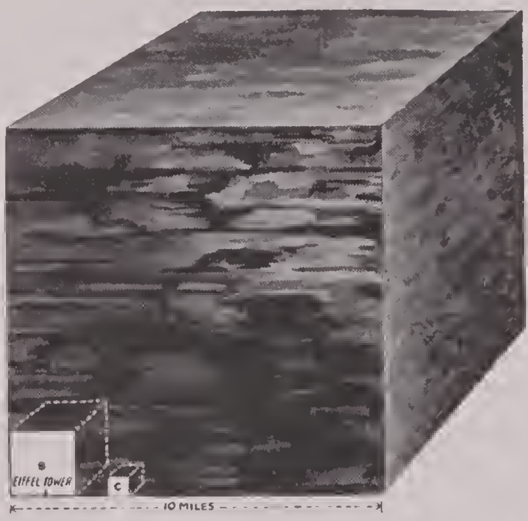
FROM THE MINE TO THE RAILROAD CAR



In general the coal veins of the United States are thicker than those of Europe. These thick veins have the advantage of enabling the miners to work standing up instead of stooping or lying down, as in narrower veins. The man in the upper right-hand corner is measuring with his pick a seven-foot vein in an Illinois mine. Notice in the lower picture the timbering required to hold up the earth and rock in the tunnel. The machine shown in this picture takes the place of men with picks. It is called a chain cutter machine, and consists of a low metal bed frame on which is mounted an electric motor that operates a chain running around that projecting board. To this chain are attached teeth which cut away the coal. The upper picture shows a typical coal-mining plant where the coal is hoisted to the surface and the cars dumped into that long chute which delivers it direct into the railway cars. This method of direct loading saves a lot of time and handling, but it makes the mine absolutely dependent upon the supply of empty coal cars. If these are not delivered constantly, the mine must shut down, for without them it has no place to deposit the coal. That is why "car shortages," such as occur from time to time, are so serious to the mining industry.

Zealand have some important deposits. In Europe the principal coal producing countries are Great Britain, Germany, France, Belgium, and Russia. Among Asiatic countries, India and Burma have abundant coal resources, and production—especially in Bengal—is increasing rapidly. Japan has only scanty coal fields; but China is very rich in this regard, though production is delayed for want of up-to-date machinery. From the known deposits in the United States, it is estimated that even at the present high rate of consumption the available supply will last for several thousand years. But to offset this the rate of consumption is increasing very rapidly.

WHAT WILL WE DO WHEN THIS IS GONE?



The large black cube represents the total coal supply of the United States. The cube marked "B" represents the proportion of the total which was used up in the fifty years following the Civil War. And "C" represents the amount consumed in a single year.

Modern machinery has added greatly to the speed with which coal is removed from a mine. A few years since the average British miner removed 236 tons a year, while in the mines of the United States, where the latest electrical devices are used, the yield is four times as great for each mine worker employed. Much has been done to lessen the hardships and dangers of the miner's life. In the removal of coal from beneath the surface, which opens tunnels and rooms of great size, some of them many hundreds of feet below the surface, the miners face the danger of falling rocks, caving in of walls, etc. They also face danger of fire in the mines, danger from the explosion of fire-damp and other inflammable mine gases, and danger from poisonous gases. Catastrophes still occur. But the substitution of the electric lamp or the safety lamp for the open flame oil lamps or candles attached to the miner's cap has lessened the danger of explosion, and delicate instruments have been invented for the detection of the presence of poison gases, so that the miner may be warned to put on his gas mask, which is similar to those used for protection from poisonous gases in the World War.

COAL-TAR PRODUCTS. The modern magician's favorite raw material is coal-tar. He waves his wand and behold, marvels of many sorts spring into being.

Coal-tar is a black gummy substance, a by-product in the manufacture of illuminating gas. It is a mixture of exceedingly complex organic substances out of which a chemist seems able to dig anything he wishes, from a disinfectant to a grease-spot remover, from a dye to a perfume, from drugs to explosives. That does not mean that all these products are contained in the coal-tar. The tar yields only about a dozen primary substances, but from these, by complicated processes, the chemist is able to build up many thousands of new compounds.

The coal-tar is distilled in huge cylindrical iron stills capable of holding 20 tons of tar. The first substances to run from the still (the first "fraction" is the correct term) are light oils, some of which are benzol (or benzene—not to be confused with the familiar "benzine"), toluol, and xylol. Benzol yields aniline, which is the source of a whole rainbow of wonderful dyes (*see* Dyes). It also gives artificial oil of bitter almonds, used by hundreds of tons for scenting soap. Toluol gives benzoic acid, which is used as a preservative; picric acid, which is used for dyes and explosives; T N T, a powerful explosive; and saccharine, which is 300 times sweeter than sugar. Xylol is used to produce scarlet and other beautiful dyes.

The next "fraction," which boils at a higher temperature than the first, contains what are called carbolic oils (*see* Carbolic Acid). From carbolic acid (also called phenol) are made dyes, picric acid, and salicylic acid. Salicylic acid is used as an antiseptic, and in rheumatism and corn remedies. Coumarin is another substance from phenol; it tastes so much like vanilla extract that it is used as a substitute. Cresols, which are chemically similar to phenol, are also in this fraction. They can be used as disinfectants even without purifying; "lysol" and "creolin" are commercial names of disinfectants which contain cresols.

The next fraction contains naphthalene, creosote oils, and quinoline. Most of us are familiar with naphthalene as "moth balls." From it are made indigo, buttercup yellow, and a variety of scarlet, pink, and green dyes. The creosote oils are used for pickling lumber to preserve it (*see* Creosote). Quinoline is an antiseptic, and also yields many dyes.

The last fraction is the anthracene oil. It is the source of alizarine dyes. The anthracene oil may not be distilled off, depending on what use is to be made of the pitch remaining in the still. If a soft pitch is desired, some anthracene will be left in it. This makes it easier to remove from the still. Hard pitch is likely to take fire when air is admitted to the still, and it gives off pungent vapors. Much pitch is made up into briquettes to be used as artificial fuel. It is also used for waterproofing and for paving.

From phenol, cresol, naphthalene, and other coal-tar products the modern chemist makes a large number of useful plastic materials. The first of these to be invented, and perhaps the most remarkable of the group, is "bakelite," which is named after its inventor, Prof. L. H. Baekeland, formerly of the University of Ghent, who also invented the quick-acting photographic paper called "Velox." Bakelite is made

MODERN IDEAS IN THE COAL MINES

THE NEW "ELECTRIC MULE"

Until recently most of the hauling in and about coal mines was done by patient mules, and many of the unfortunate animals remained below ground for months at a time. But the day of the mine mule is almost over. Electric locomotives, like the one shown in the picture, have proved themselves less expensive haulers than the mules, in spite of their first cost. These mine locomotives are built very low, because much of their work is done in passages not more than four or five feet high.

INSIDE THE TIPPLE HOUSE

This is a view of the inside of a tipple house. The tipple house is where the coal is distributed for storage or loaded into railway cars for shipment. The coal from the mines is hauled to the top of the tipple house, and from there travels down chutes. These chutes can be arranged to send the coal to any destination desired. The picture shows the conveyors and shakers for sorting the coal according to size.

GATHERING UP THE SLACK THAT WAS ONCE THOUGHT VALUELESS

Until a few years ago the slack or culm, a mixture of fine coal and dirt after all coal lumps had been taken out, was thought valueless. It was dumped at convenient points near the mines and left to accumulate. But now that business conditions resulting from the World War have made economies and increased efficiency necessary in all industries, methods for using inferior coal are coming into use. These slack piles are therefore being worked over, and all coal material that can be recovered is being marketed. Since huge slack piles are to be found throughout the country, the value of the material which can be recovered is considerable.

from carbolic acid and formaldehyde. In common with others of these resin-like materials, bakelite has the property of being easily molded, machine stamped, and milled; yet after baking it becomes very hard and strong and resistant to the action of heat, water, gases, acids, and electricity. In one form it is much used in electrical machinery; also wood, paper, cardboard, cloth, sawdust, and other materials are soaked in the soft resin and transformed by heat and pressure into tough and hard materials suitable for various purposes. By another process bakelite may be made into a transparent material colored like amber. Being stronger and more brilliant than amber, and odorless, tasteless, and noninflammable, it is used as a substitute for amber in pipe stems, cigar holders, beads, and many other similar articles.

"Redmanol" is a similar plastic material made by the action of formin instead of formaldehyde on carbolic acid. "Condensite," used for phonograph records, buttons on United States navy uniforms, eyeglass frames, and electrical apparatus, is made by the action of chlorine on naphthalene.

And these are only a few of the wonders we get from coal, which in burning has also produced coke, gas, and ammonia.

THE COBRA'S TASTE FOR MUSIC

Somebody over there, out of sight—a snake charmer probably—is playing a flute, for this is how the Cobra rears itself when the flute is played, keeping time by swaying its head.

CO'BALT. Have you ever heard of the kobolds? In old German folk tales the kobolds were mischievous little gnomes or goblins, who lived in caves and mines and delighted in annoying and teasing mortals in every way they could.

When the chemists of several hundred years ago were working with metals, they used to be greatly bothered by two impish substances that sometimes occurred with copper and iron and were very hard to separate. So they called one of these substances "cobalt" because it plagued them like the kobolds, and the other "nickel," after the "Old Nick" or devil.

Today, of course, we have no trouble in separating these metals, so we know that cobalt is a silvery white element, much like nickel but having a slightly pinkish tinge. By itself cobalt has no very important commercial uses. The chloride of cobalt is well known as a so-called sympathetic ink; letters written in an ink made of the pinkish solution of this chloride are practically invisible at ordinary temperatures, but when the paper is heated the "ink" turns blue and the writing is easily read. Left to itself for a little while, it re-absorbs moisture from the air and again becomes invisible.

The chief use for cobalt is in making a blue pigment called *smalt* or *powder blue,* used in painting china and glazing pottery, in coloring glass, and in giving a blue tinge to paper and linen. Smalt is made by fusing sand, cobalt oxide, and potassium nitrate, and grinding the resulting glassy substance to powder.

The world's chief source of supply of this metal is near the town in Canada that bears its name—Cobalt, Ontario. Germany, Sweden, England, and other European countries produce limited quantities. The principal ore is *smaltite,* which contains cobalt in combination with arsenic.

CO'BRA. Of all poisonous snakes, the most feared is the *cobra de capello,* the "hooded terror" of India. Few creatures, indeed, are more awe inspiring than a six-foot cobra standing guard in a jungle-path. One-third of its yellowish-brown body is raised on high, swaying gently to and fro like the stem of some strange plant which carries at its tip a fearful blossom—the head with the glaring eyes, the darting tongue, the hissing breath, surrounded by the great spoon-shaped expansion of the neck. That sinister figure spells death to any man or beast that seeks to pass.

Because of its imposing appearance the Indian cobra and its relatives in other parts of Asia and Africa have been worshiped since the beginning of history. In the ancient Egyptian hieroglyphics the figure of the cobra with expanded hood occurs constantly. Even today the high-caste Hindus can hardly be induced to kill these dangerous creatures, which are very numerous and which are responsible for a large part of the 20,000 deaths annually due to snake bites in the Indian peninsula.

The cobra feeds on insects, lizards, frogs, and small mammals, and frequently enters human dwellings in search of mice and rats. While it does not seek quarrels, it will not go to great trouble in avoiding them, and once aroused it becomes vicious and aggressive.

Yet with all its dangers, the cobra is the favorite of snake-charmers, who in many cases do not trouble to extract its poison fangs. A few simple notes on the flute are enough to "soothe the savage breast" of this serpent, which will thereupon rear itself in the air and sway in time to the music. "If you do not fear him," say the charmers, "he will not bite."

The curious hood of the cobra is formed by the ribs of the neck which the snake can raise and expand at will, stretching out the folds of loose skin. The common Indian cobra (*Naja tripudians*) displays on the back of its hood a light yellowish mark more or less the shape of a pair of spectacles.

The "king cobra" or *hamadryad* is a much larger snake, sometimes 13 feet long. Though rarer than the common cobra, it is equally dangerous, its bite having been known to kill an elephant in three hours. It feeds principally on other snakes.

The African cobra (*Naja haje*) is one of several snakes to which the name "asp" has been applied. It infests almost all parts of Africa. One of its relatives, known to the Boers of the south as the "spy-slange," has the peculiar habit of spitting its venom to a distance of three feet or more.

Cobras usually live in pairs, near the water. The female lays about 20 soft-shelled eggs of the size of pigeons' eggs, which are hatched by the sun.

COCHINEAL (*kŏch'ĭ-nēl*). Cochineal is a natural dyestuff, scarlet or crimson in color, made from the tiny bodies of the females of certain species of scale-insects found in Mexico and South America. These insects, which belong to order *Hemiptera*, feed largely on a species of the cactus plant, called *nopal*; and there are now large plantations of this cactus where the insects are cultivated as carefully as the silkworm. Enormous numbers of eggs are hatched, and when the females of the second generation are just ready to lay their eggs they are brushed off the plant to which they adhere, gathered in trays, and placed in a hot oven or put in boiling water. They are later dried thoroughly in the sun. From the dead bodies ten per cent of pure dye is obtained. The dried insects have the form of irregular or fluted grains, and it takes 70,000 of them to weight a pound.

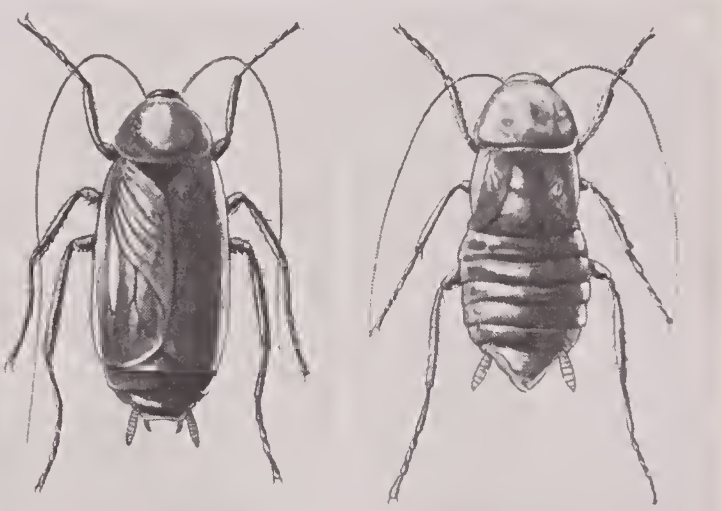
Cochineal paste is made from these dried bodies by covering them with ammonia water and immersing the uncovered vessel in hot water. Part of the ammonia evaporates; that which remains dries and forms the paste, which is then ready for use in dyeing. Owing to different methods of preparing the dye and the time when the insects are killed, this paste is not always the same shade.

The cultivation of the cochineal insect (*Coccus cacti*) was successfully introduced into Europe, Algeria, and Australia; but of late years the plantations have been abandoned everywhere except in Mexico, because of the increasing use of aniline dyes.

COCKATOO. A large bird of Australia and the East Indies closely related to the parrot, but distinguished chiefly by a higher bill and a long, broad, and rounded tail. The name is derived from its harsh cry. The true cockatoos (*Cacatua*) are generally white, often tinged with red, orange, and other colors; they have large heads surmounted by crests of yellow or pink feathers which they can raise at will and expand like a fan. Leadbeater's cockatoo excels all others in the beauty of its plumage. In cockatoos of the related genus *Calyptorhynchus* the general plumage is black or dark brown, with a touch of yellow or red at the tail. The vocal efforts of the cockatoos are limited to very few words. (*See* Parrots, Macaws, and Cockatoos.)

COCKROACH. Why is a cockroach? Many a weary housewife has asked this question, as she has struggled to rid her dwelling of these insect pests. Nobody has a good word to say for them. They do, it is true, kill bedbugs and devour refuse, but such good as they do in this respect is far exceeded by the offensive odor they emit and the food they spoil.

MR. AND MRS. COCKROACH



Most of us, unfortunately, are acquainted with cockroaches, but would you know that on the left here is *Mr.* Cockroach and on the right *Mrs.* Cockroach? Notice what long wings Mr. Cockroach has, and that Mrs. Cockroach has hardly any at all.

Cockroaches are close relatives of the grasshoppers, locusts, crickets, "walking-sticks," and mantids, though they look more like beetles. Fossil roaches are found in such large numbers that scientists believe that in the coal age of the earth's history, roaches were the most numerous of insects.

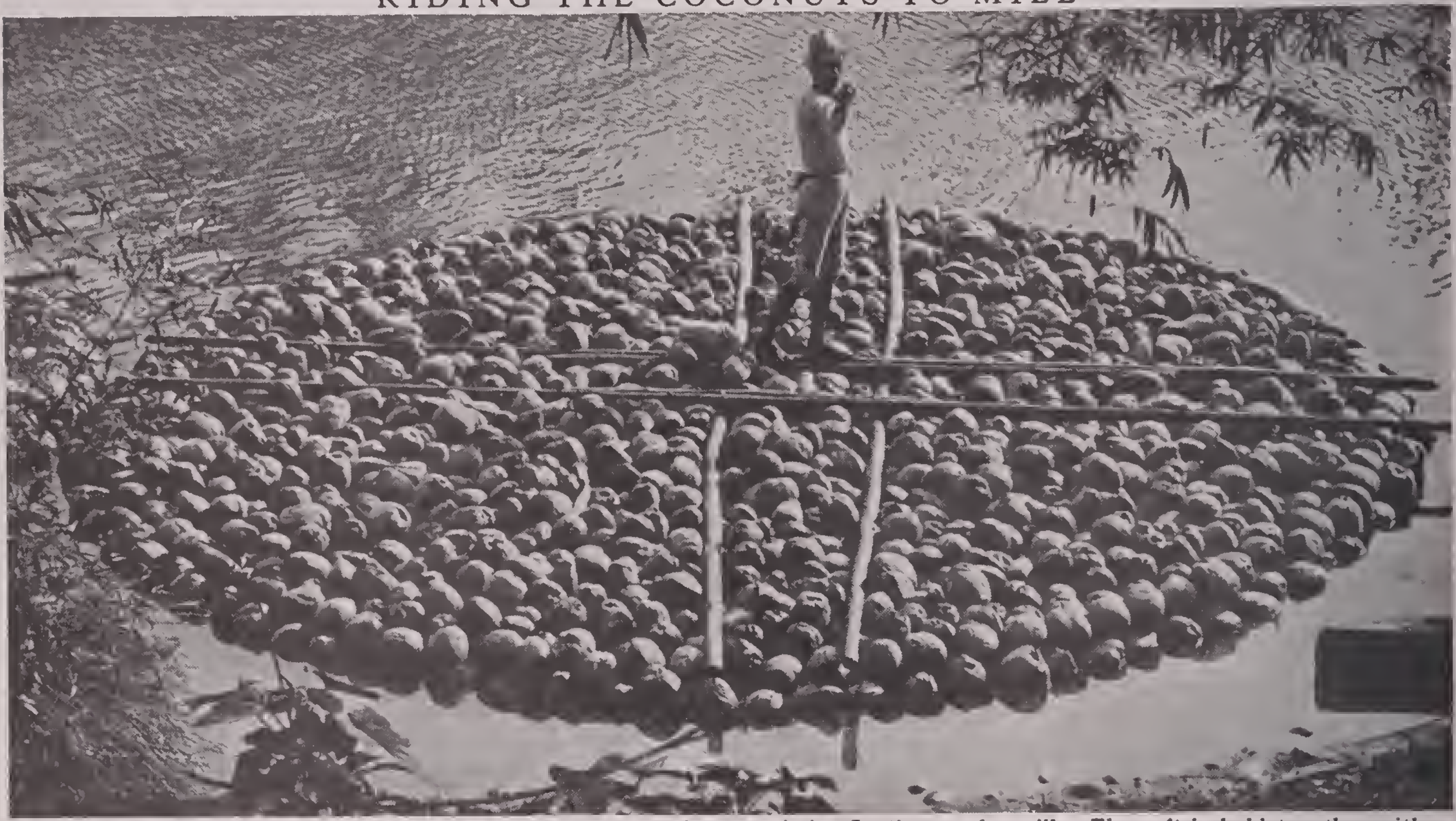
These smooth brownish insects have broad flat bodies, which enable them to crawl about between walls, in cracks, or along water pipes. They have long powerful legs and can run with great rapidity. Each leg is armed with spines projecting backwards which serve as weapons. When attacked, they advance backwards upon their foe and astonish it with a shower of kicks. In this way they have been seen to put even large scorpions and tarantula spiders to rout. Their antennae or feelers are very long, sometimes as long as the body, and are very slender. Sometimes these are composed of more than one hundred joints. The male cockroach is provided with wings, while the female has only small ones, or none.

Cockroaches lie hidden in the daytime and come out to run about and feast at night. So greedy are they that they have been known to bite through book covers to get at the paste beneath, and even to eat the nails and eyelashes of sleeping children. They can be partially got rid of by the use of insect powder or phosphorus paste, or by fumigation with pyrethrum powder or sulphur.

Cockroaches belong to the order *Orthoptera*, which means "straight wings," and to the family *Blattidae*. Not all cockroaches inhabit houses. Many of them live respectable lives in the fields and woods, under logs, stones, etc. The chief offenders in our houses and other buildings are the German roach or Croton bug (*Phyllodromia germanica*); the oriental roach (*Periplaneta orientalis*), the large reddish-brown American cockroach (*Periplaneta americana*), and the smaller Australian cockroach (*Periplaneta australasiae*). The eggs, called "nits," are laid in little bean-shaped "pods."

COCOA. The dried and powdered seed-kernels of the cacao tree; as a beverage, cocoa is made more digestible than chocolate by the removal of part of the cocoa butter, or fat, contained in the cacao "beans." (*See* Cacao; Chocolate.)

RIDING THE COCONUTS TO MILL



In the Philippine Islands coconuts are sometimes made up into a raft for floating to the mill. The raft is held together with a framework of sticks and cords, and the nuts are protected from the action of the water by their fibrous husks and hard shells.

COCONUT PALM. One of the first plants to appear in a newly formed tropical island is the stately and graceful coconut palm. The seed, which is the coconut (also spelled cocoanut) of commerce, is securely protected from the action of sea water by its thick fibrous husk and hard shell. It is thus peculiarly adapted for distribution by ocean waves and currents, and may be carried over a thousand miles from the parent plant to grow on some distant shore.

This fact accounts for its wide distribution. Originally native to certain islands of the Indian Ocean or of tropical America, it is now found on most tropical shores in the East and West Indies, and particularly in the tropical islands of the Pacific Ocean. These beautiful trees lend distinction and attractiveness to the islands. To the cultivation of the coconut is largely due the increasing commerce and rising civilization of many of those remote islands.

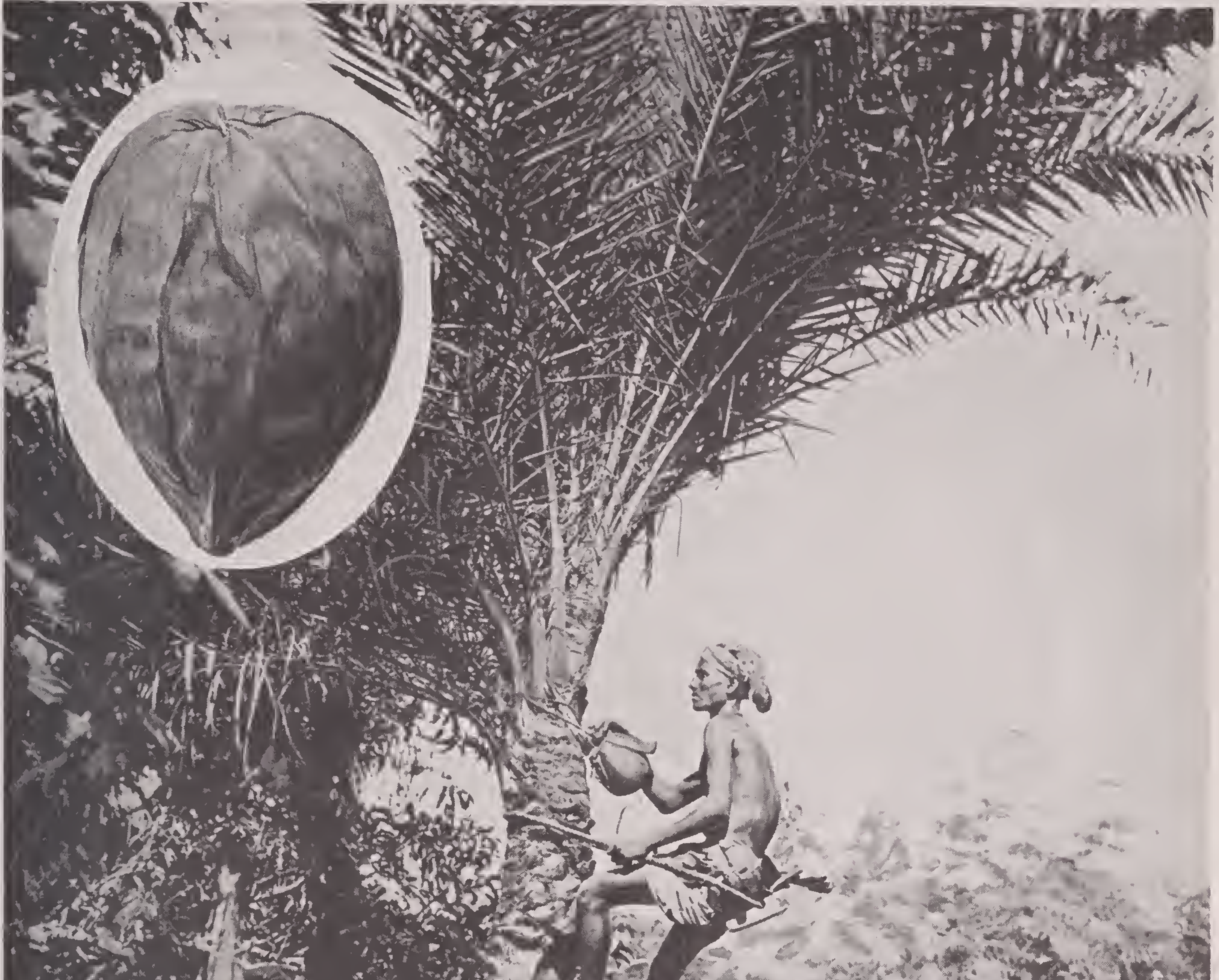
The coconut palm is one of the tallest and most ornamental of the palms. Its smooth straight trunk attains a height of 100 feet and is crowned with a cluster of long branched leaves. The fruits or coconuts mature in bunches of from 10 to 20. As they grow they are oblong masses 12 to 18 inches in length and 6 to 8 inches in diameter. A tough fibrous husk incloses the nut, whose hard shell is lined with the food-material, within which again is the so-called coconut milk.

The coconut palm is propagated only by seeds, and when once established, a coconut plantation insures a lifetime of profit and ease for the grower. After the first two years the trees require practically no attention. They begin to bear about the sixth year, and from then on each matures from 50 to 60 nuts a year. The bearing period lasts from 70 to 80 years.

No tree known to man has a higher commercial value than the coconut palm. It is also the most useful of all trees to the natives of the regions in which it grows. The fresh meat of the nuts furnishes a nourishing food, and the milky juice forms a pleasant and refreshing drink. The terminal bud furnishes the well known palm "cabbage" used as an article of food. The trunk yields timber, the leaves are used in making baskets and fans and in thatching the roofs of houses; the shell is used as a water vessel, and the husk yields the *coir* fiber from which are made mats, ropes, and brushes.

The most important article of commerce produced by the coconut is the *copra* or dried nut meat. This

WALKING RIGHT UP A TREE IN COCONUT LAND



A South Sea islander thinks nothing of marching right up the smooth trunk of the Coco Palm. And it is really marching, for he simply throws a loop of rope around himself and the palm, to keep from falling over backward. Then he grips the trunk with his clever clinging toes, and up he goes, hitching the loop up at each step. The upper inset picture shows a coconut in its fiber coat; and in the lower picture the nut is cut in two to show the hard shell, the white "meat" which supplies the copra of commerce, and the hollow that contains the "milk."

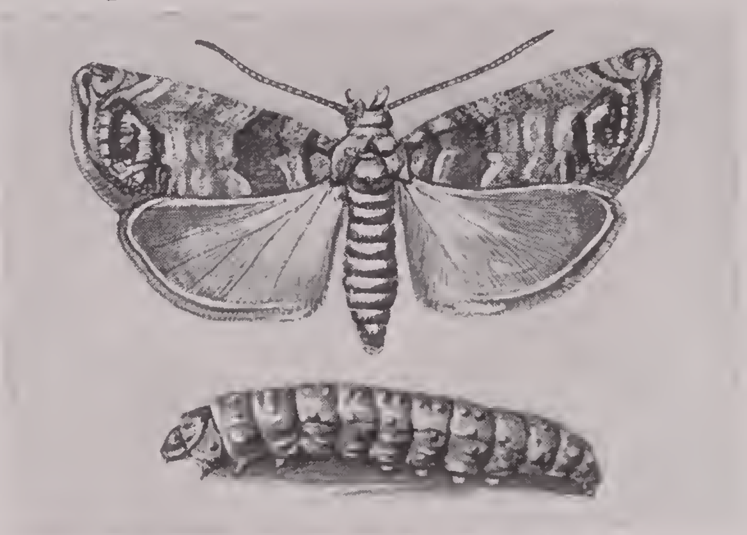
contains from 50 to 65 per cent of coconut oil, which has been used as a food in the Far East since the dawn of history. In western countries the oil is largely used in making soaps, candles, butter substitutes, and lubricants. The fats of coconut oil are so much like milk fats that in recent years a new industry has sprung up in the manufacture of "nut margarine," a palatable butter substitute (*see* Oleomargarine).

Scientific name, *Cocos nucifera*. Trunk smooth, straight, unbranched, 80 to 100 feet high; leaves pinnate, 10 to 20 feet long; flowers in branching spikes 5 to 6 feet long.

Cod. A salt-water fish found in the colder parts of the ocean, especially on the Grand Banks of Newfoundland; it is one of the world's greatest food fishes. (*See* Fish; Fisheries.)

Codlin moth. One of the worst insect enemies against which the fruit grower has to fight is this little gray moth, with its pretty brown markings. For this harmless-looking insect produces the white worm that you often find in the heart of an apple, destroying much of its value for the market. It does at least $10,000,000 worth of damage every year.

THIS IS THE APPLE "WORM"



How often have you bitten into a nice ripe apple and found that there was somebody there ahead of you—a little white "worm"? Here's an enlarged picture of one of the adult caterpillars and his pretty but pestiferous parent, the Codlin Moth.

The codlin moth lays its eggs in the apple blossoms. These hatch out into tiny *larvae*, or caterpillars; and as the apple forms at the base of the blossom they eat their way into its center. The apples that are infested with the larvae drop off the tree long before they are ripe. The larvae then eat their way out, and spin about themselves cocoons of fine silk threads, attached underneath the bark of apple trees. While they are in this stage (the *pupa* stage), sleeping until they grow into moths, large numbers of them are eaten by woodpeckers. When the pupae change to moths, they come out of their cocoons and fly to apple blossoms to lay their eggs for the next brood.

To kill the moth larvae, orchardists spray the trees with paris green solution or lead arsenate, just as the blossoms fall. Scientific name of the codlin moth, *Carpocapsa pomonella*.

Cody, William Frederick (1846–1917). A noted American army scout and frontiersman, better known as Buffalo Bill, later famous for his "Wild West" shows. (*See* Buffalo Bill.)

From COFFEE PLANTATION *to* BREAKFAST TABLE

The Frisky Goats that Discovered the Coffee Plant—How the Strange Bean from Abyssinia Captured the World—Its Thrilling Trip to the New World, and How Today it Finds its Way into Your Cup

Coffee. Toward the end of the 3d century after Christ, some monks, fleeing from persecution, found refuge in the highlands of Abyssinia, across the Red Sea from Arabia. There they supported themselves by tilling the soil and raising flocks. One night one of the good fathers whose turn it was to watch the goats and sheep came running to the monastery, pale and trembling.

"The animals are bewitched!" he panted. "They gambol and play as if it were a spring morning."

"Peace, my son; you have been dreaming," the prior reassured him. "Rest here and I will go to the fold."

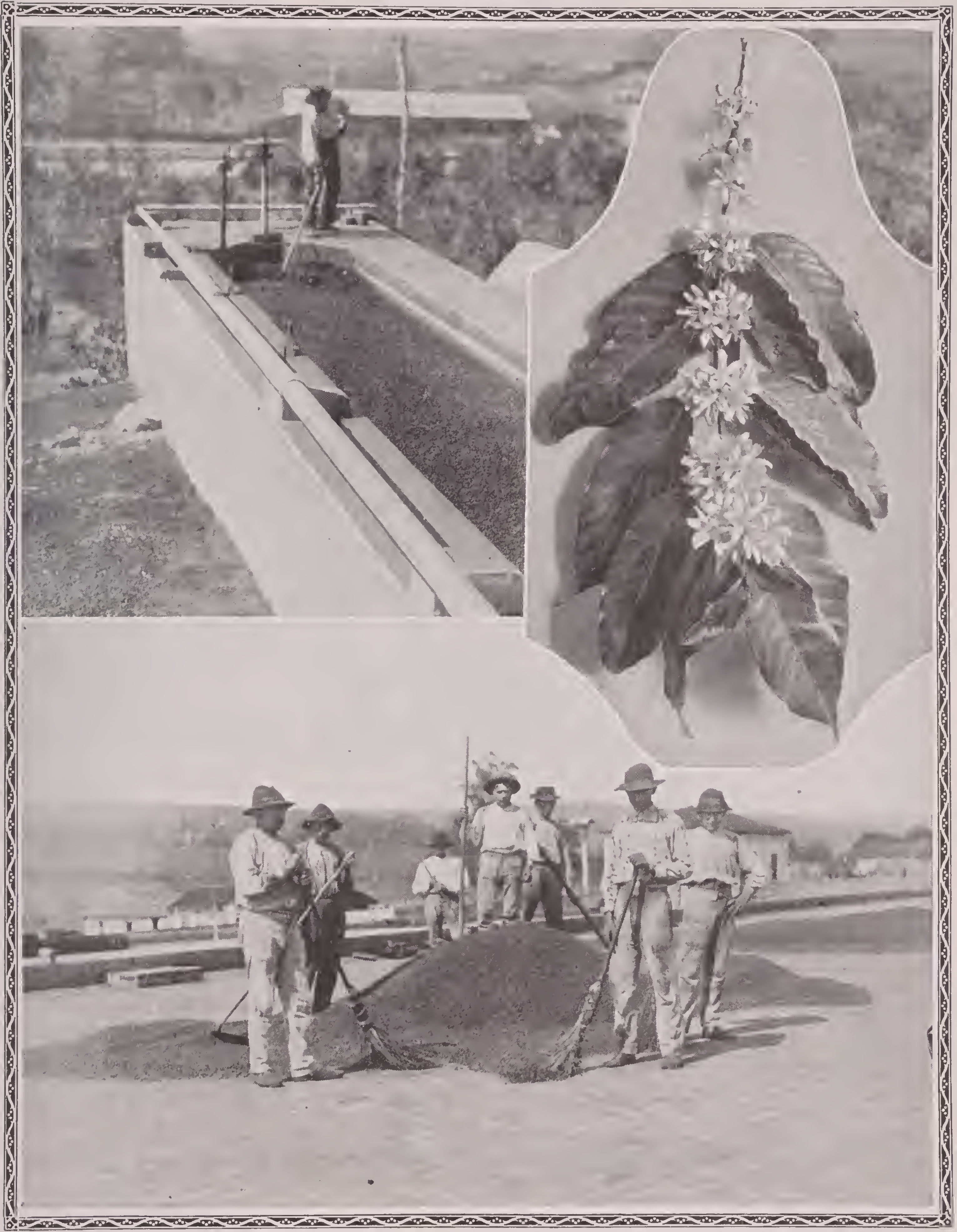
But the prior too found the animals frisking and romping in the moonlight, instead of sleeping as they should. Night after night this continued, in spite of prayers and exorcisms. By observing what plants the animals browsed on, the prior at last convinced himself that the sleeplessness was due to the leaves and fruit of a certain unfamiliar shrub which there grew in profusion. Picking some of the ripe cherry-like fruits, he chewed the seeds, and found that he too felt an unusual exhilaration and was wakeful that night.

Thus coffee was discovered, according to one of the many legends current among the Arabs. However fanciful the story may be, the fact remains that Abyssinia and Arabia were the original homes of the coffee shrub. We also know that by the 15th century pilgrims to Mecca used to drink an infusion of the roasted coffee bean to prevent drowsiness during the long religious services of the Mohammedan faith.

How the World Learned to Drink Coffee

From Arabia the practice passed to Constantinople, and thence to Venice, and to England, France, and other European countries, largely through the example of the Turkish ambassadors. Coffee houses sprang up and speedily became the favorite resorts of people of fashion, politicians, artists, and men of letters. From the associations thus formed our modern clubs developed. The first coffee house in London was established in 1652, and within 20 years such places had come to play so important a part in the social and political life of the day that Charles II attempted to suppress them on the ground that they were "semina-

COFFEE—FROM BLOSSOM TO DRYING FLOOR



The life of the coffee berry begins in the starry white blossoms, which are very beautiful against their dark glossy leaves. After the crimson berries are gathered, they must pass through several stages before they are ready for market. Above you can see the berries being washed in a huge cement trough, into which water is constantly flowing. As the workman stirs the berries, the mashed pulp is carried away by the current of water and the seeds (or "beans") allowed to settle. The beans are then dried, as in the picture at the bottom, which shows a drying ground in Brazil. With their brooms of native brush, the men stir the green beans about and finally, when they are ready to be removed, sweep them up in great piles on the brick-paved floor. The beans are allowed to remain here under the hot sun for several days, and are frequently turned so they may dry evenly. In some places the coffee beans are dried indoors by artificial heat.

ries of sedition." In Paris, too, many coffee houses were set up. How important they became is shown by the fact that one of our common names for a restaurant (*café*) is the French word for "coffee" or "coffee house."

Americans the Greatest of Coffee Drinkers

Coffee is more extensively used in the United States than in any other country in the world, though the French also are great coffee drinkers. The United States imports more than one-half of the world's output, and the consumption averages over 10 pounds a year for every man, woman, and child.

Until the end of the 17th century all the coffee of commerce came from Arabia, being shipped from Mocha (or Makha), once the capital of the province of Yemen. Thus we get the name Mocha, which is still applied to all Arabian coffee as well as to coffee resembling the Arabian in color and taste. Coffee cultivation thence spread to Java, in the Dutch East Indies, and finally throughout the tropics of both hemispheres.

How One Coffee Tree Supplied the World

The vast coffee plantations of Brazil and the West Indies, which produce three-fourths of the world's coffee, are said to be the offspring of a single coffee tree. A few plants, brought from the Dutch plantations in Java, were presented to the King of France. These he sent to the West Indies to be planted. The voyage was long and tempestuous, and one by one the plants died, until only one was left. Water became scarce, and the faithful officer to whom the mission had been entrusted divided his scanty allowance with the plant, which lived and became the parent tree for the plantations of the New World.

To visit a coffee plantation, we must go farther south than the United States, for the plant needs a warm climate where the temperature never falls below 60 degrees. Neither will our visit take us to lowlands, for coffee thrives best 1,200 to 2,000 feet above the sea, where the soil is rich with red iron rust or with the gray soil of volcanic rocks. The air must be fresh and dry, and the land hilly, so that drainage will be easy. If you look at a map of Brazil, you will find that the great coffee-producing states of São Paulo and Rio de Janeiro lie in the uplands near the coast just within the tropics. The chief coffee-growing regions, in addition to Brazil and the West Indies, are Central America, Mexico, Arabia, parts of Africa and India, Ceylon, Sumatra, Java and the Pacific islands, especially the Philippines and Hawaii.

As we approach a *fazenda* or coffee orchard the wind sweeps out a great wave of fragrance like that of white honeysuckle, but far sweeter. So completely is the dark shiny foliage covered with the starry jasmine-like flowers that it looks as though a shower of snow had fallen on the slender trees. There is a great fluttering and buzzing of gorgeous butterflies, bees, and locusts; and myriads of brilliant humming-birds dart about the trumpet-shaped flowers. As we come nearer we notice armies of ants, marching and countermarching between their nests and the trees. They are very useful in keeping in check the insect pests that ravage the coffee plants.

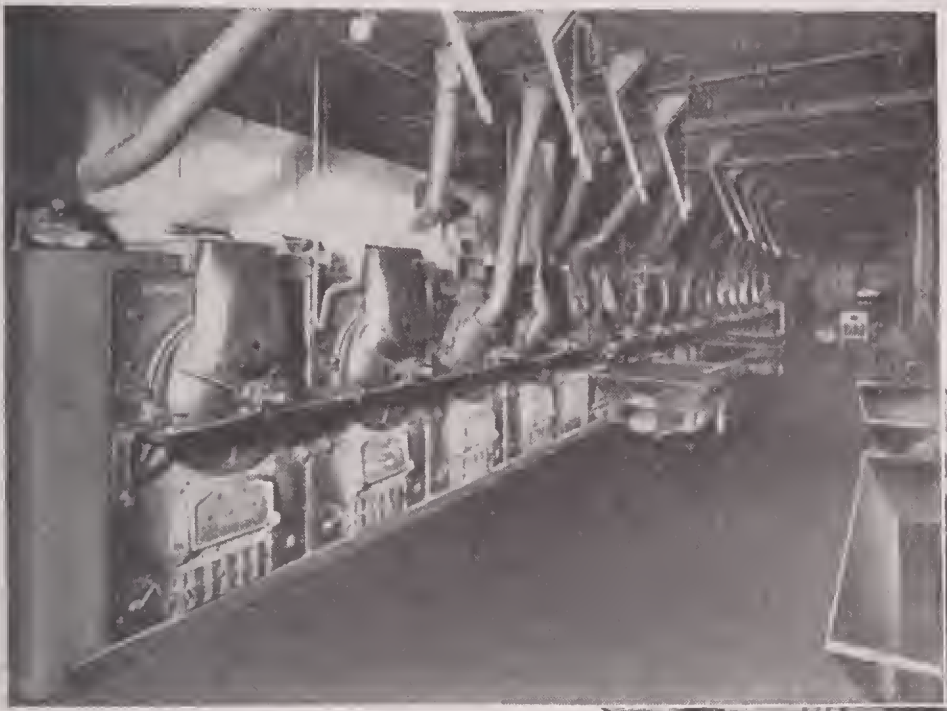
The wild varieties of coffee grow 20 feet or more in height, but the cultivated trees are kept trimmed to 6 or 8 feet, so that the berries may be picked more readily. The cherry-like berries change from green to light yellow, then to scarlet, and last of all to a deep

A COFFEE PLANTATION IN BRAZIL

More than a billion pounds of coffee are produced in Brazil in a single year. Most of it comes from the state of São Paulo, which in itself furnishes more than half of the world's supply. Here are miles and miles of coffee bushes stretching as far as the eye can reach.

crimson. When they are ripe, the skin shrivels like an over-ripe cranberry. The sweet yellow pulp envelops a pair of oval seeds, lying with their grooved and flattened faces together—the familiar coffee beans. Sometimes there is only one seed, called from its shape a "pea berry"; these are carefully separated, for they bring a higher price. The plants continue flowering for eight months, so that they have buds, flowers, and fruits at every stage of development, all through the season. There are usually three gatherings a year, called the "early," the "chief," and the "after crop."

ROASTING, WEIGHING, AND PACKING



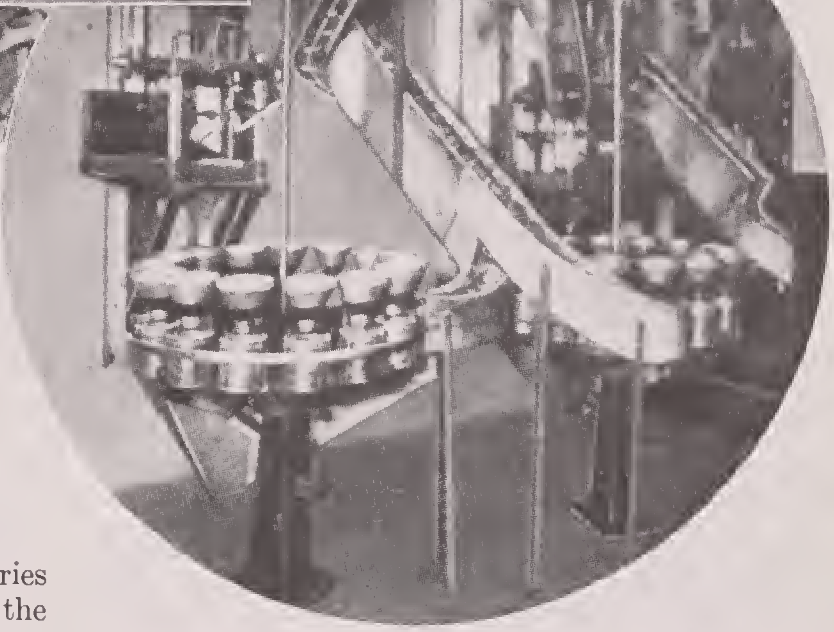
These great roasters are much more efficient than our grandmothers' ovens. Within the roasters, the coffee beans are kept revolving so they will brown evenly. When they are the proper color they are cooled with a suction draught.

How the Coffee Beans Get Ready to Travel

The pickers usually spread out on the ground a large piece of cloth into which they drop the berries. When a tree has been stripped the berries are emptied into bags or baskets and hauled to the "seeders." There they are squeezed in machines like huge nutmeg graters to mash the pulp and loosen and separate the seeds, which are then scoured clean in tanks. The seeds are still covered by a tough white "parchment" hull, which is removed by being broken between rollers after the seeds have been thoroughly dried in the sun. A delicate covering as thin as tissue paper, called "the silver skin," still remains. This is rubbed off and the seeds, after being sorted and bagged, are ready to be shipped.

But these raw or green coffee beans are tough and horny, and have none of the aroma and taste we like. The characteristic flavor and odor are developed by roasting, which develops an aromatic oil known as *caffeine*, and produces other chemical changes. When grandma was a girl, coffee was bought green and roasted at home, but it was often scorched and burned and the delicate flavor ruined. Now the coffee is blended and roasted in the big wholesale grocery and coffee houses. Huge cylinders toss the coffee about over a fire and brown it evenly throughout. Since the delicate flavor quickly disappears, coffee should be used as soon as possible after roasting and grinding. The longer the bean is aged before roasting, however, the mellower is the flavor.

Americans like their coffee a clear rich brown, usually with cream and sugar added. The French are very fond of *café au lait*, which is hot milk and strong coffee in about equal proportions. In the Orient the usual practice is to grind the raw beans as fine as flour. This makes a thick black beverage, which is drunk grounds and all. In Sumatra a "coffee-tea" is prepared from the roasted leaves of the coffee plant.



With the up-to-date machinery of today it is not necessary for human hands to touch the coffee. This ingenious machine automatically weighs and packs the browned beans.

Many plants are used to adulterate coffee, such as dandelion root, carrots, beans, parsnips, the seeds of the common yellow iris, and dried sweet potatoes. The commonest adulterant is the root of the chicory plant, which belongs to the same family of plants as the dandelion, lettuce, and endive. Many substitutes are also offered, most of them made from cereals, which are all free from the alkaloid *caffeine*—the characteristic constituent of coffee. Chemically, caffeine is identical with the *thein* of tea. These give coffee and tea their physiological effects.

WHERE THE COFFEE GOES ON SHIPBOARD

These men are loading coffee at Santos, Brazil, which is the outlet for the great coffee plantations of São Paulo. About 15,000,000 bags of coffee are shipped annually from this port to North America and Europe.

To test coffee for purity, drop some finely ground into a glass of cold water. Coffee is light and has oil in it, so it will float for a long time and color the water very slowly. Even when it is boiled, coffee has to be "settled" with an egg or a dash of cold water. Chicory and other roots or grains sink at once.

There are about 80 recognized species of coffee, although only two are cultivated to any great extent: Arabian coffee (*Coffea arabica*) and Liberian (*Coffea liberica*). The wide differences in coffee depend on climate, soil, and age. The most important varieties used in the United States, with their peculiar qualities, are these: *Bogota* (Colombia), bluish-green, full and mellow; *Central American*, large, greenish to yellow, mild and mellow; *Hawaiian*, large, variously colored, rich and mild; *Haiti*, greenish-yellow, mild and sweet; *Java*, large, variously colored, mild and mellow; *Manila*, large, yellow to brown, mild; *Mexican*, large, greenish to yellow, mild and mellow; *Mocha*, dark green to yellow, pungent and full; *Porto Rico*, greenish, strong; *Rio* (Brazil), medium to large, green, rank and strong; *San Domingo*, greenish yellow, low-grade and strong; *Santos* (Brazil), large, greenish to yellow, mild; *Sumatra*, large yellowish to brown, mild. What is principally sold as Mocha is Santos first growth. Most so-called Java coffee is grown in Sumatra or Central America.

COKE. When coal is heated in a closed oven, and the gases and other matter are driven off, the residue we call coke. This is a hard brittle porous substance, chiefly carbon, with a steel-gray glint; and it rings with a metallic sound when struck. Coke does not readily soil the hands, and it makes an intense heat and burns with a pure flame free from smoke. For these reasons it is used instead of coal or wood for household fires, and also for smelting ores, especially iron.

In the production of coke the coal is washed, screened, and assorted as to size, and is then placed in coke ovens—all by machinery. There are two chief types of oven, the "by-product" and the "beehive."

The former is much like a gas plant, so arranged as to collect the ammonia, coal-tar, and other valuable by-products (*see* Coal-Tar Products). In the beehive ovens, so called from their shape, all the vapors and gas burn at the upper opening and are wasted, and the yield of coke is only about 66 per cent, against 73 per cent from the by-product oven. In the United States more than three-fourths of the coke is made by the wasteful beehive process. Much coke also is obtained as a by-product in the manufacture of illuminating gas. About two-thirds of the entire output of the United States is made in Pennsylvania.

COLBERT (*kōl-bĕr'*), JEAN BAPTISTE (1619–1683). To Colbert, her greatest financial statesman, France still looks back with gratitude for his efforts to correct abuses which eventually led to the French Revolution. When he was called by Louis XIV to take charge of the finances of the country, he brought to his task an experience gained by his work for Cardinal Mazarin. He had brought order out of chaos in the financial affairs of that statesman, and for his services had been recommended to the king. According to report Mazarin on his deathbed had said to Louis XIV: "I owe you everything, but I pay my debt to your majesty by giving you Colbert." Colbert fully justified this recommendation.

When he took charge of the treasury in 1664, the expenses of the government were each year exceeding its income. Within a year he was able to restore the balance, and even increase the income several million dollars above expenses. Best of all, he did this without increasing the burden of taxation. He discovered that officials were stealing great sums from the revenues. These men were arrested and forced to give up their ill-gotten gains, and a new system of bookkeeping was introduced to check such abuses.

Colbert also encouraged manufacturing, both by establishing new industries and by seeing that the older ones produced high-quality goods which would sell readily in foreign markets. Roads were improved and canals built, so that commerce might be aided. And finally, science and learning were encouraged by the establishment of the French Academy of Sciences, the building of an observatory, and the support of a periodical magazine, which is still published, devoted to the reviews of new books.

But Colbert could not curb the military ambitions of the extravagant king. Before his death he was hated by his countrymen, because he had been compelled to increase taxes in order to meet the expenses of Louis XIV's reckless wars and the enormous cost of the vast new palace at Versailles. When Colbert died he felt that his work had been in vain, and that France was on the verge of ruin.

COLD STORAGE. If you live in a city you get much of your foods from dealers who in turn are supplied by cold storage warehouses. Fruits, eggs, butter, meats, vegetables, and poultry are shipped from remote or nearby districts, some of them from Florida or the Isle of Pines, others from east or west or north or south, wherever they may be produced. The cold storage plant holds them until your dealer orders them.

In this way we are able to have a great variety of foods on our tables the year round, our health is preserved by a varied and fresh diet, and prices are kept steadier. If there were not cold storage plants large stocks of food would rot, producers might become discouraged, and the average of prices would be increased through scarcity. And, incidentally, dealers and fine ladies could not so easily preserve their furs from the "moth" that "doth corrupt" were it not for our cold storage warehouses.

Cold storage preserves food because the bacteria of decomposition cannot work below certain temperatures. This enables us to keep some kinds of foods for years. In the snows of Siberia a mammoth's flesh was preserved for 20,000 years or more, and when it was found, dogs eagerly ate its flesh. The first "cold storage warehouses" were caves and cellars. Even now many farmers have "root cellars," and other places underground for storing milk, cream, butter, and eggs. Modern methods depend upon the use of ice or artificial refrigeration (*see* Refrigeration).

Because of the importance of the cold storage industry, and the opportunity it affords unscrupulous dealers to create an artificial scarcity by keeping immense quantities of food out of the market for long periods, thus raising prices, both federal and state laws have been passed in the United States regulating the length of time butter, eggs, poultry, and other foods may be kept in cold storage.

COLERIDGE, SAMUEL TAYLOR (1772–1834). "Stop, you young thief!" An angry gentleman in a crowded London street was storming at a pale innocent-looking little lad, whose bare head, long blue coat, and yellow stockings marked him as a pupil of Christ's Hospital, the famous charity school. The boy's outstretched arms fell and his dreamy eyes flashed with a strange light. "Ah," he sighed, as if rudely awakened out of a delicious dream, "I thought I was Leander swimming the Hellespont. I did not mean to touch your pocket, sir."

The little bluecoat was Samuel Taylor Coleridge, and the result of this strange incident was that the old gentleman bought for him a subscription to a circulating library. So the little dreamer went on reading and acting out what he had read, and living in his own world of strange and beautiful fancies. Back in Devonshire in western England—before his father died and he was sent to school in the great city—he used to roam about the fields near his native village of Ottery St. Mary and slash off the tops of weeds as he went, imagining himself St. George slaying the Dragon. At the age of five, when most children are just beginning to spell out their first picture-books, he had already read the Bible, 'The Arabian Nights', and 'Robinson Crusoe'.

At Christ's Hospital he was a brilliant student, and at Cambridge University which he entered at the age of 18 he won several prizes for scholarship. But he got into debt, ran away to London, and enlisted in the army under an assumed name. After a few months his friends secured his discharge and he returned to the university, but he left it later without obtaining his degree.

During these early years Coleridge became fired with the ideals of the French Revolution. With his friend Robert Southey he planned to go to America and found a "pantisocracy" or ideal commonwealth, where farming and literature were to be combined, and no one was to work more than two hours a day. As a start they married two sisters, and then found they had no money to go further with the project.

Coleridge's natural disposition to day-dreaming, increased by the use of opium which he started taking to relieve the pains of neuralgia, was the weakness that wrecked his life and made his work a mere fragment of what it might have been. Indeed, had it not been for the help of friends, he could not have got along at all. On the other hand it is to this same imaginative power that we owe his unsurpassed dream-poems —'The Rime of the Ancient Mariner', 'Christabel', and 'Kubla Khan'—which take us into the world of the supernatural where shines "the light that never was on land or sea."

Among Coleridge's other intimate friends were Charles Lamb the essayist and the poet Wordsworth. On account of their residence in the beautiful northern lake district and the similarity of the poetical ideals they expressed, Coleridge, Wordsworth, and Southey were known as the "Lake Poets."

In spite of his frailties, the personal influence of Coleridge was very great, and in his last years he was visited by many noted men who listened spellbound to his marvelous talk. "He is the only wonderful man I ever met," said Wordsworth. "He talked on forever," said Hazlitt, "and you wished him to talk on forever." Carlyle called him "a king of men" in spite of his failures; and Lamb said humorously that he was "an archangel a little damaged."

Today it is for the few great poems written in his earlier years that Coleridge is chiefly remembered. Of his poetry it has been well said, "All that he did excellently might be bound up in 20 pages, but it should be bound in pure gold."

Though we think of Coleridge chiefly as a poet, he wrote more prose than poetry. His 'Biographia Literaria' (1817) gives a profound analysis of the nature of poetry and the principles of criticism. His 'Lectures on Shakespeare' (1849) show that he was one of the greatest of Shakespearean critics. 'Aids to Reflection' (1825) is the most famous of his many philosophical and religious works.

Coligny (*kō-lē-nyē′*), **Gaspard de** (1519–1572). In the midst of the political intrigue which marked the religious wars in France during the last half of the 16th century, stands out the figure of Gaspard de Coligny, Admiral of France. While so many of the leaders of both parties—Catholics and Huguenots alike—were using the bitter spirit of religious controversy for their personal advantage, Admiral Coligny, head of the Protestant cause in France, won the respect of both sides by his unselfish devotion to what he believed were the true interests of his native land.

GASPARD DE COLIGNY
Huguenot leader of France

His straightforward policies were destined to cost him his life. Born of a noble family in Chatillon-sur-Loing, two years after Luther began his Reformation, Coligny from his youth had a brilliant military career which won for him the title of admiral in 1552. Through the influence of his brother, Francis d'Andelot, he became a Huguenot, exchanging letters with Calvin and using his power to protect the members of the new faith.

After the tragic death of King Henry II in a tournament in 1559, Coligny placed himself with the Prince of Condé in the forefront of the Huguenot party, and demanded religious toleration from the government. Despite his efforts to obtain a peaceful settlement of the religious troubles, civil war broke out; and after Condé had been killed at the battle of Jarnac, in 1569, Coligny was left chief leader of the Protestant armies. After gaining a victory at Arnay-le-Duc, he brought about a truce and returned to the court, where he rapidly gained the favor of the young king, Charles IX.

Catherine de Medici, the queen mother, saw in the friendship between Coligny and her son a menace to her ambitions. This sinister woman wanted to keep in her own hands the power she had wielded ever since King Henry's death, and Coligny, with his wise powerful counsel, stood in her way.

On Aug. 22, 1572, Coligny was wounded by the shot of an assassin, hired by Catherine and members of the Guise family, leaders of the court intrigue. King Charles at first swore to avenge the attempt on Coligny's life, but the next day Catherine and her favorites so worked upon the fears and prejudices of the young king that he consented to Coligny's death, crying in his desperate mood: "If you must kill him, then let all the Huguenots in France be killed, so none may be left to reproach me."

Catherine asked nothing more. Most of the leading Huguenots of France were even then in Paris, drawn there by the wedding a week before of their leader, King Henry of Navarre (later Henry IV of France), with the king's sister. Secret plans were laid at once, and on the night of August 24, the feast of St. Bartholomew, at a given signal the massacre of the Huguenots began.

Coligny was among the first to die. The wounded man was attacked in his house by a group led by Duke Henry of Guise. A German named Besme plunged a sword through his breast and threw his body out the window. Before St. Bartholomew's terrible night had passed, thousands of Huguenots had shared the fate of their leader. The massacre spread to other parts of France, lasting into the month of September. Though estimates differ as to the total number of victims, it is generally believed that more than 20,000 were killed before the fanatical fury had abated. It was reported that the Pope had caused a *Te Deum* to be sung in St. Peter's in honor of the event, but this is not historically true.

Coligny sent three unsuccessful colonies of Huguenots to the New World—the first in 1552 to Brazil; the second to South Carolina, which first settled Port Royal, in 1562; and the third to Florida, where a promising settlement was made at Fort Caroline, on the St. Johns River, in 1564. This, however, was exterminated—"not as Frenchmen, but as heretics"—by a Spanish expedition the next year.

Winning the KNOWLEDGE *that is* POWER

Who wouldn't enjoy going to college in such surroundings as these? The campus of Cornell University, which is here shown, overlooks Lake Cayuga in New York state and is famous as one of the most beautiful college settings in the world.

NEVER before has the old adage that "Knowledge is Power" been so true as in these days when scientific experts—in engineering, manufacturing, agriculture, law, medicine, and a hundred other lines—are mastering the boundless universe; and never before has the investment in a university education paid such large returns on the outlay! This article offers to the boy or girl about to go to college helpful guidance in the selection of a school, and after that, in the choice of college studies. It also sketches briefly the history of universities and colleges from the distant days when Abelard lectured in his bleak Paris lodgings to students huddled in the straw on the floor, to the superbly housed universities of today, with vast libraries, laboratories, and playing-fields, and faculties of scholars whose researches daily advance the limits of man's knowledge.

COLLEGES AND UNIVERSITIES. Every boy and every girl knows that if you wish to become a doctor, a lawyer, a dentist, a mining engineer, a mechanical engineer, a teacher, or a journalist, the best way to prepare is to go to college. Colleges and universities are schools which offer studies beyond those of the high school, for the sake of preparing young men and young women for professions and occupations which are open only to those who have pursued advanced studies.

When a college student has successfully completed a course of study, he is graduated and receives a diploma just as when he was graduated from the eighth grade and from high school. But he gets something else besides—namely, a title or, as it is commonly called, a "degree." A graduate from a medical course receives the degree of Doctor of Medicine and can now hang out his sign as an M.D. Graduates from the law course receive the degree LL.B., that is, Bachelor of Laws. In like manner the completion of other courses earns other degrees.

Value of College Degrees

College degrees are of great value. In many states only those who have secured them from some approved institution can enter the occupations for which they stand. Even if the laws of the state do not require a doctor, a lawyer, or an engineer to have earned a college degree, the fact that a man has one increases people's confidence in him and leads them to seek his services. There are many occupations and professions besides those named above for which our colleges and universities offer training and grant diplomas and degrees. Some of the most important of these are agriculture, forestry, pharmacy, dentistry, accounting, government service, home economics, library work, chemical engineering, and journalism.

Besides such professional courses every college gives a general course which is not intended to prepare directly for any definite profession or occupation, but which aims to continue the same kind of broad training and instruction which the high school gives. The studies most prominent in such a four-year general course are languages, mathematics, history, natural sciences, and social sciences. Such a general course is commonly called "the liberal arts course." Other names given it are "the science, literature, and the arts course," "the academic course," "the classical course," "the literary course," "the course in letters."

The ordinary arts course covers four years. The first year is called the freshman year; the second, sophomore; the third, junior; and the fourth, senior. These same names, freshman, sophomore, junior, and senior, are applied not only to the four years, but to the classes and to individual students. At some colleges the school year is divided into two parts of 18 weeks each, called semesters; at other colleges, into four parts of about 12 weeks each, including a summer term, which are called quarters or terms.

The best professional schools will not admit a student until he has completed a year or more, generally two years, of a liberal arts course, and a few professional schools will admit only those who have graduated from a four-years' liberal arts course. The liberal arts course therefore is taken by many students as a preparation for admission into professional colleges. It is also taken by nearly all who are planning to become teachers. The degree most commonly granted to graduates of the liberal arts course is the B.A., also written A.B., which means Bachelor of Arts. Nearly every university offers more advanced courses for students who have graduated from college and who wish to continue their studies further.

The degree M.A., Master of Arts, or M.S., Master of Science, is granted to those who have successfully completed at least one year of post-graduate study; and the degree of Ph.D., Doctor of Philosophy, to those who have completed successfully three years of post-graduate work. Men and women who have earned the Ph.D. degree are just as much entitled to be addressed as Doctor So-and-So as those who have earned the M.D. degree.

Why Should I Go to College?

There are two chief reasons for going to college. The first reason is that college offers you a preparation for a useful life. No state can prosper today unless it has many scientifically trained agriculturists, foresters, doctors, engineers, teachers, etc. College is the place where young men and young women get the training which enables them to render efficient and noble service to their state and to their fellow-men. It is because states have recognized the need of such service that they have established state universities and colleges. One of the most remarkable things ever done by a democratic government is to tax itself to the extent of millions of dollars a year to furnish a college education as nearly free as possible to its young men and young women.

The second reason for going to college is that a college education increases one's earning power and one's chances for success. Every year there is published in the United States a volume entitled 'Who's Who in America'. This volume contains the names of living men and women who have become eminent, and gives a brief account of their work and education. A few years ago an investigation was made to try to discover how much a good education increases a man's chances of having his name included in 'Who's Who'; in other words, of becoming an influential and important citizen. It was found, first, that out of nearly 5,000,000 men and women in the United States who had had little or no education, only 31 were sufficiently successful in any line of work to obtain a place among the leaders listed in 'Who's Who'. Second, that out of 2,000,000 with high school training, 1,245 had gained this distinction. Third, that out of 1,000,000 who had received a college or university education, 5,768 had gained a place in 'Who's Who'. This shows conclusively that a man with a college education has many times the chances of any other man of becoming a citizen of influence and importance.

Money Value of a College Education

Dr. Charles F. Thwing, an eminent educator, found that there were 277 times as many men with a college education who had amassed great wealth as there were of men without a college education. A comparison made of men employed by the Western Electric Company who had had a college education with those who had had only a high school or elementary education showed that whereas only 10 per cent of the high school and grade school graduates succeeded, 90 per cent of the college men succeeded in life. Still other investigations have shown that every additional year of schooling brings financial returns out of all proportion to the time spent and the money invested. An investigation made of the salary income of the graduates of a university class ten years after graduation showed that a college education is worth on the average to the young man receiving it about $25,000.

But college has many other things to offer you besides instruction and professional preparation. There is another side of college life called the social side. This, if entered into rationally and without over-emphasis, will play a valuable part in developing you and in preparing you to mingle with your friends and fellow citizens. This social life has given rise to a large number of debating clubs, literary clubs, dramatic clubs, musical organizations such as glee clubs, bands, orchestras, and to religious associations. Besides such organizations there are at many colleges secret organizations known as fraternities (for young men) and sororities (for young women). Since these organizations are known by certain Greek letters which are the initials of Greek words composing the organization's name, they are often called Greek letter societies. Admission into them is only by invitation, never by application. Originally organized as self-improvement associations for the sake of maintaining lofty moral and intellectual standards, they have in some instances become exclusive clubs whose mode of life is opposed to democratic principles. The oldest Greek letter society, Phi Beta Kappa, founded in 1776, long ago abolished all secrecy and is now an honor society composed of those who distinguish themselves as students. Very much like it is Sigma Xi, for the best students in the sciences.

As in high school, so in college, games and athletics hold a high place in the esteem of the student body. Recognizing that physical pastimes arouse interest in physical development, most colleges provide fine

COLLEGE GIRLS ACTING THE SCENES OF LONG AGO

Here is one way colleges have of combining physical and mental education. These students of Vassar College will know the spirit of ancient Greece far better after enacting classic dances and plays, and will develop strength and grace as well.

gymnasiums, athletic fields, and facilities for outdoor sports, such as lawn tennis, football, and baseball. The "Yale Bowl" and the "Harvard Stadium" are great concrete stands which accommodate thousands of spectators, the Yale Bowl alone seating some 60,000 persons. Princeton has an artificial lake where its rowing crews receive their training.

Requirements for Entrance to College

Every college and university sets up certain requirements which must be met by students seeking admission. Sometimes all that is required is the satisfactory completion of a four-year course in a public high school or in some other accredited (that is, approved) secondary school. Other colleges state definitely just what studies students must have pursued during their high school course. Some colleges require, in addition to graduation from an accredited secondary school, an examination in certain subjects. In many Eastern colleges no student is admitted without a certain amount of Latin or Greek.

A CHARMING SCENE IN A CHARMING THEATER

For such outdoor acting as this, Vassar has provided an open-air theater seating 3,000. The ground is the stage, and a magnificent setting of trees and water provides the background.

In deciding what course to take, your own interest and special abilities should be your chief guides. Bear in mind, first of all, that not every boy or every girl ought to try to go to college. There are many for whom the intellectual tasks will prove too severe and such are doomed to failure and disappointment. If, however, you have done well in your studies in the elementary school and in the high school, and if you like to study, then the chances are that you will profit from a college education.

Before you can select your college intelligently it is necessary to know something about the different kinds of colleges. In the index volume of this work you will find a list of all the important colleges and universities in the United States and Canada. With the aid of this list you will be able to locate some good college of the type you seek near to your own home, and as well suited to your needs as those named in the present article solely for the purposes of illustration.

Some colleges are open to men only, others to women only, still others to both men and women. The latter are called "co-educational" colleges. Besides these, certain men's colleges maintain colleges for women. Examples are Radcliffe College at Harvard and Barnard College at Columbia. Colleges may be further classified as follows:

Public: (1) State colleges and universities, supported and controlled by the state.
(2) Municipal colleges and universities, supported and controlled by some city, such as the College of the City of New York, and the University of Cincinnati.

Private: (1) Denominational, supported and controlled by some religious denomination.
(2) Non-denominational colleges and universities.

Every state in the Union has a state university or a state college of some sort. Among the best-known state universities in America today are those of California, Illinois, Michigan, Minnesota, and Wisconsin. If you wish to get information about your own state college or university and do not know how, write to the State Superintendent of Public Instruction of your own state, addressing him at the capital.

About two-thirds of the colleges and universities in the United States and Canada are controlled by some religious denomination. There is probably not a single religious denomination in the United States which does not maintain its own colleges. But more renowned than any denominational institution are certain private non-denominational colleges and universities which arose in the early days of our country and which have provided the education, generation after generation, of social and intellectual leaders. In this group must be included, first of all, Harvard, Columbia, Yale, Princeton, and the University of Pennsylvania. Two institutions not as old but of the same general character are Cornell University and Leland Stanford Junior University.

A COLLEGE SETTING FOR STERNER SPORTS

Who would suspect, unless he knew, that the darkened area inside this stadium consists of approximately thirty thousand people? This airplane view shows the famous "bowl" at Yale, wherein Yale's athletes contest with the teams from other colleges. It can hold 60,000 spectators.

Work of the "Junior Colleges"

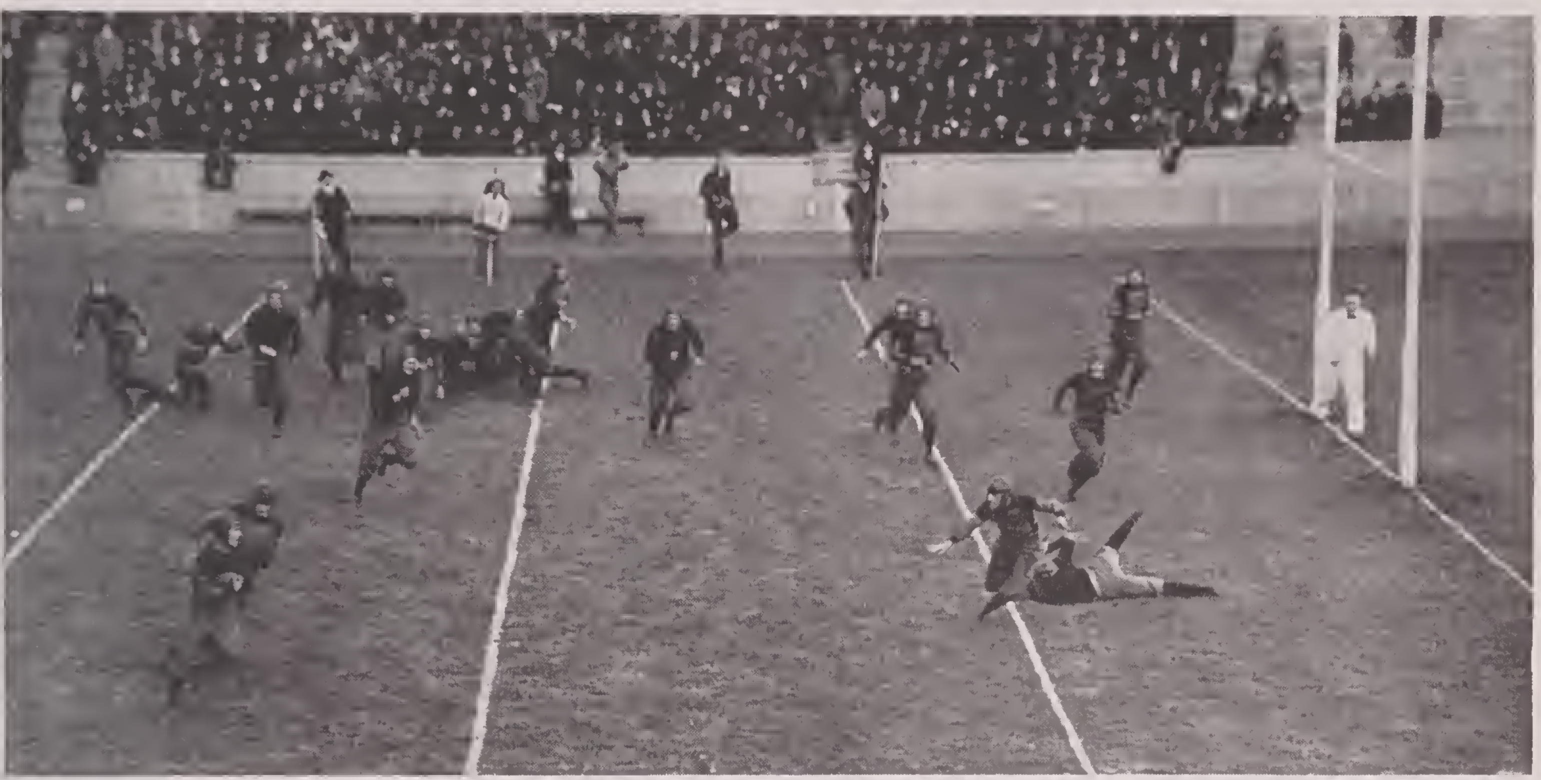
A group of institutions copied to a considerable extent after Yale and Harvard is the group of small New England colleges, such as Dartmouth, Bowdoin, Williams, and Amherst. The most widely known women's colleges in the United States are Bryn Mawr, Vassar, Smith, Mount Holyoke, Wellesley, and Wells. An increasing number of strong high and normal schools are offering the first one or two years of college work and are known as "junior colleges."

Before choosing your college write to every institution which interests you and ask for its catalog. This is the only way in which you can make an intelligent choice. The numbers and training of the faculty, the number of volumes in the library, and the annual income are all clues to the rank of the institution. Your final decision will depend largely upon what you wish to gain from your college course. If it is your desire upon leaving high school to continue your general education, then the smaller college, denominational or non-denominational, will have much to offer you. If, however, you desire to prepare for some profession, the larger institutions, with their immense libraries, finely equipped laboratories and shops, should receive your careful attention.

Every large university and many smaller ones have courses in engineering and other technical subjects. State institutions are especially strong in these fields, owing to the assistance which they have received from the federal government. In 1862 Congress passed an act known as the Morrill Act which granted government lands to the states in order to aid them to establish colleges of agriculture and mechanic arts. Some states, such as Wisconsin and Minnesota, established their agricultural college as a part of their state university. Others, like Washington, Michigan, Iowa, and the New England states (except Maine), set up separate institutions. There are colleges which have nothing except technical courses and which consequently constitute a class by themselves. Two well-known technical colleges in the United States are the Massachusetts Institute of Technology (for men) and Simmons College (for women).

Nearly every college and university has scholarships or fellowships, which sometimes cover a large portion of a student's yearly expenses, and which are

A MOMENT THAT STIRS THE HEARTS OF COLLEGE MEN!



A Princeton player with the ball under his arm is making an "end-run" for his opponents' goal line, while the Harvard defenders rush to "tackle" him. Such sports develop the sense of team play and loyalty which college men showed so well in the World War.

awarded to students of especial merit. If you wish to go to college and have not sufficient funds, send a letter addressed to the registrar, asking him what chances there are of getting a scholarship and also of earning your way. Remember this, that thousands of boys and girls in every state in the Union are earning a large part of their college education and many of them are earning every penny. What is most needed is a good mind, determination, and the willingness to do well whatever comes to hand.

If despite all your efforts you should find yourself unable to go to college, you may nevertheless acquire part of a college education through the extension department maintained by many colleges and universities. These extension departments establish classes in communities where there are enough students to justify them. They also offer correspondence courses in a wide range of university subjects and in some high school subjects. Among the universities most widely known for their extension and correspondence courses are Brown, Chicago, Columbia, Minnesota, and Wisconsin. The registrar of your own state university or college will tell you whether such courses are offered.

A HAIRBREADTH FINISH ON THE TRACK

A Princeton runner is "breasting the tape" a fraction of a second ahead of his Harvard rival, with another Princeton man coming third. Track meets with their many events are in high favor in colleges.

The medieval university, dating back to the 12th or 13th century, is the outgrowth of the schools connected with the cathedrals and monasteries throughout Europe. When some popular teacher, as Abelard or Peter Lombard, drew crowds of students (there were 30,000 students in Paris, it is said, in the days of Abelard), there usually followed a corporation to which was given the name of *universitas* (meaning "all of us" or "the whole body"). Some of the early universities, as that of Paris, were formed by the "masters" or teachers; while others, as Bologna, were corporations of the students.

The chief purpose of these early universities was to educate men to be priests, and both students and masters wore gowns which marked them as members of the clergy. Since the instruction was entirely in Latin, students could easily pass from one university to another, even when the institutions were located in countries which spoke different languages.

The degree of "doctor" or "master" at first entitled the person who received it to teach in the university giving the degree. Pope Nicholas III near the end of the 13th century granted the University of Paris the right to endow its graduates with the power to teach anywhere. The degree of "bachelor," borrowed from the terms used in knighthood and indicating an imperfect or partial graduate, that is, one who had finished only the lowest stage of university work, was first introduced at the University of Paris in the 13th century. The "liberal arts" (Latin, grammar, rhetoric, logic, arithmetic, geometry, astronomy, and music) were studied in what we should call the "undergraduate" course; beyond these lay the faculties and courses of theology, law, and medicine. The colleges, as the different schools connected with a university are called, at first were mere boarding-halls, which were later appropriated to the faculties of different departments.

THE ANNUAL TREE DAY PAGEANT AT WELLESLEY

After the pageant these women students march to the spot on the campus where the Freshman class, in accordance with custom, plant a memorial tree.

The Universities of Europe

One of the oldest universities of Europe was the University of Paris, which was organized in the 12th century. The Sorbonne was formerly the theological school of this university, but in modern times it became the chief university institution in Paris for science and literature. The University of Bologna, with its charter given by Frederick Barbarossa in 1158, was especially celebrated for its study of the Roman and canon law; and that of Salerno, of the 12th century, for its instruction in medicine. Some of the chief universities in Germany are Heidelberg (1385), Leipzig (1409), Jena (1477), Tübingen (1478), and Berlin (1810).

All of the German universities are for "graduate" students, that is, those who have completed their studies in what we should call a college. They are under the control of the government, and most of them are dependent upon appropriation of funds by the state for their support.

The universities of Switzerland, Holland, Belgium, Russia, and Austria are on the German model. That of Prague, founded in 1348, is the oldest in central Europe. Louvain, in Belgium, founded in 1425, was once very famous, as was also the University of Leyden, in Holland, founded by William of Orange. The University of Salamanca, in Spain, established in 1415, had at one time 10,000 students and 28 colleges. The oldest Scandinavian university is at Upsala in Sweden.

Of the English universities, Oxford and Cambridge are the oldest, dating back to the 13th century. The University of London has no colleges directly connected with it, but confers degrees upon examination on students of many institutions. In addition there are thriving municipal universities of recent origin in Birmingham, Liverpool, Manchester, Leeds, and other places. The chief Scottish universities are at Edinburgh, Glasgow, Aberdeen, and St. Andrews, that of St. Andrews being the oldest; they are patterned more after the German universities than those of England. The University of Dublin (1591) is the oldest university of Ireland.

The old system of residential "colleges" or halls more nearly survives in Oxford and Cambridge than anywhere else. This system distinguishes the older universities of England from those of the continent, for a student must connect himself with a college before he becomes a member of the university. The teaching in these colleges is done almost entirely by tutors, and the professors of the university only deliver lectures on special subjects once or twice a week. Degrees are dependent upon examinations, and fellowships are provided by means of which promising

TRAINING TO DEFEND HARVARD'S PRESTIGE ON THE WATER

Here are Harvard's crews out for a practice row on the Charles River, in preparation for later contests. They spend months in training for races that are decided in a few minutes. But to college men victory, cleanly won, is worth the time and effort it costs. Even those who do not participate learn that worth-while results are only to be won by thorough preparation and trained ability—a lesson that will serve them and the nation well in their later lives.

students can continue their advanced studies in spite of financial handicaps. (*See* Oxford.)

In the United States, the term university is loosely applied to many institutions which strictly are only colleges, just as the term college includes many schools of academy and high school rank. In its strictest sense the term university is limited to institutions having several professional "schools," such as those of law, medicine, commerce, etc., in addition to the regular college course in "liberal arts"; and in which post-graduate work is carried on in the higher branches. Harvard University (1636), at Cambridge, Mass., and Yale University (1701) at New Haven, Conn., are among the oldest and best equipped universities in the United States. Johns Hopkins University, at Baltimore, Md., and Clark University at Worcester, Mass., are modern foundations, more nearly on the German model, intended primarily for post-graduate students.

Canada has a long list of notable colleges and universities, of which some of the chief are Toronto University; McGill University (Montreal) and Laval (Quebec and Montreal); Dalhousie (Halifax); and the new universities of Alberta, Saskatchewan, Manitoba, and British Columbia.

For a list of standard colleges and universities in the United States and Canada, *see* the Easy Reference Fact-Index under the heading Colleges and Universities.

COLLO'DION. This clear, colorless, gummy, and highly inflammable liquid is prepared by dissolving cellulose nitrate (pyroxylin) in an equal-parts mixture of alcohol and ether. Collodion was once extensively used in photography, and for some lines of that art is still used. It is very commonly used in minor surgery, being especially valuable for scratches, chafings, and slight cuts, as it dries to a tough elastic film which keeps out poisonous substances and is not soluble in water. In one of its commercial forms it is known as "new skin." Collodion is also used for producing artificial silk. Dissolved in nitroglycerin it makes the powerful explosive, blasting gelatine. (*See* Cellulose; Silk.)

COLOGNE (*kō-lōn'*), GERMANY. To approach Cologne on a Rhine steamer is to view a scene which lives long in the picture-gallery of the mind. Amidst beautiful hills it lies in a half-circle on the left bank of the historic river, with its medieval towers and buildings dominated by the spires of the great Cologne cathedral. Surrounding the city is a broad boulevard called the "Ringstrasse," while still farther away is a line of fortifications which entirely encircle the city. Connecting the city proper with its suburb Deutz, across the river, is the massive Hohenzollern Bridge—over which British troops crossed the Rhine when they occupied the sector around Cologne, after the armistice had ended the World War of 1914–18.

The cathedral, which was begun about 1248 and not finished until 1880, is one of the most complete specimens of Gothic architecture in Europe. The interior is impressive, with its beautiful choir, vaulted arches, painted glass windows, and forest of tall treelike columns, making an imposing picture of majestic simplicity. The heaviest of the cathedral's seven bells was made from 22 cannon captured from France in 1871. It bears this inscription, in strange contrast to the spirit of militarism which animated the German Empire whose birth accompanied its own:

COLOGNE CATHEDRAL AND ITS HEAVEN-POINTING SPIRES

Can you help looking toward the top of this famous cathedral, which stands in Cologne, Germany? This is what the Gothic architects wanted to make you do. Those sweeping lofty lines express the high religious motives that inspired its builders.

> The Emperor's bell—that is my name—
> The Emperor's honor I proclaim.
> On this holy tower I stand
> And ever pray for the German land,
> That God would grant it, without surcease,
> Unsullied honor and hallow'd peace.

The churches of Cologne hold many relics about which fascinating tales are told. The church of Saint Ursula is said to contain the bones of 11,000 British virgins who were massacred near Cologne while on their way to Rome; and Saint Gereon's is lined with the bones of Theban martyrs, slain, according to tradition, during the reign of Diocletian. In St. Peter's there is a famous altar-piece by Rubens, who was born in Cologne and baptized in that church. The "Three Kings of Cologne," whose bones are buried in Cologne Cathedral, were supposed to be the three wise men who came from the East to pay homage to the infant Christ. According to legend, the bones were brought to Milan in 1162 by the Emperor Frederick Barbarossa. The church atmosphere is everywhere in Cologne, for it was long part of the principality of the Archbishop of Cologne, one of the original "seven electors" of the Holy Roman Empire.

Cologne also has many fine secular buildings and monuments. Among the buildings are the Gürzenich, built by the Town Council in 1441–52 to entertain distinguished guests; the Rathaus, or "city hall"; and the Tempelhaus, now the chamber of commerce. Chief among the monuments is the colossal equestrian statue of Frederick William III of Prussia.

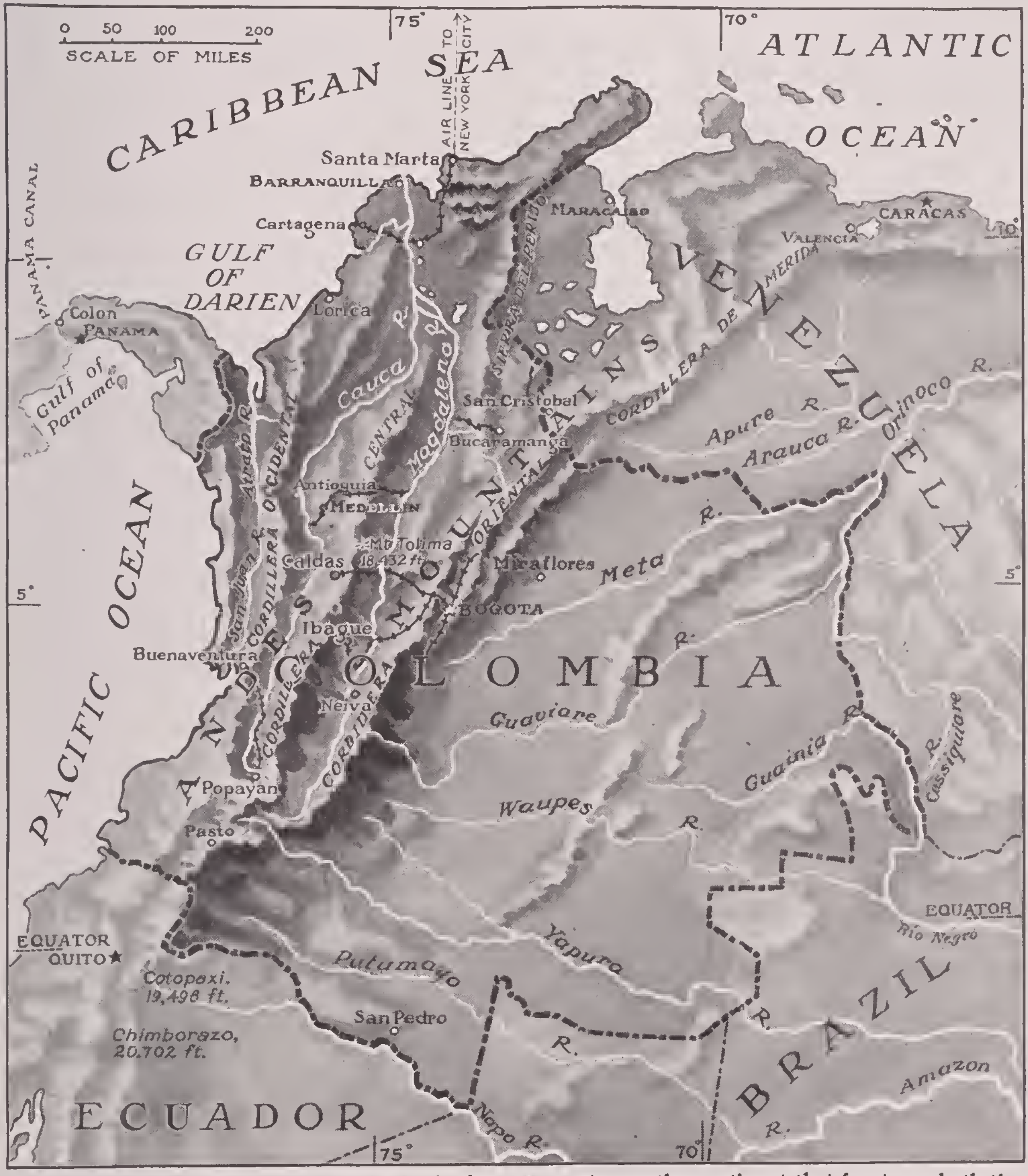
Cologne, which the Germans call *Köln,* is a very old city, for it gets its name (Latin *Colonia Agrippina*) from the fact that a Roman colony was founded here in 51 A. D. It came under the rule of Prussia in 1801. Because of its location on the Rhine, it has always been an important commercial center, distributing corn, wine, oil, coal, mineral ores, and manufactured articles. Cologne is widely known for the perfume, *eau de Cologne,* made here. Its other manufactures are many and varied, and include beet sugar, tobacco, glue, liqueurs, candles, soap, velvet, silks, woolen goods, India rubber wares, and machinery. Population, about 516,000.

At the FOOT *of the* PANAMA ISTHMUS

Once a Treasure Mine for Spain, now a Producer of Panama Hats and Coffee— Colombia's Snow-clad Mountain Tops and Lowlands of Tropic Heat— A Country of Ups and Downs!

COLOM'BIA. This South American republic, named in honor of Christopher Columbus, who explored part of its Atlantic coast in 1502, is strategically located on both the Atlantic and the Pacific oceans, with about 700 miles of coast north of the Isthmus of Panama and 500 to the south. It thus has an advantage over its neighbor republics which may be of the utmost importance as the Panama canal trade grows.

A COUNTRY THAT STRADDLES SOUTH AMERICA



South America's outpost to the northwest is the one country on the continent that fronts on both the eastern and western oceans. Its principal river, the Magdalena, unites the capital, Bogotá, with the Caribbean Sea; the harbor of Buenaventura is its gateway to the Pacific.

On the north Colombia faces that part of the Atlantic Ocean called the Caribbean Sea, the "Spanish Main" of the buccaneers and pirates of Elizabethan days. Mute evidence to the terrors of those stirring days is afforded by the massive walls of Cartagena, its principal seaport, which was captured and held to ransom in 1586 by Sir Francis Drake. To the north, between Colombia's 700 miles of coast on the Caribbean and its 500 miles on the Pacific, lies the republic of Panama, which seceded and became an independent state in 1903. To the east Colombia's boundary-neighbor is Venezuela; on the south it adjoins Ecuador, Peru, and Brazil. With four of these countries Colombia has boundary disputes not yet settled, so its area is variously estimated at from 438,000 to 482,000 square miles, making it fifth in size of the South American states.

Despite its tropical location, with its southwestern border lying on the equator, Colombia presents remarkable variations of climate. In a few days, as you climb from the coast to the lofty mountains and tablelands of the Andes Range in the interior, you pass from the torrid plains of the Magdalena River, where the stones are often so hot that you cannot pick them up, to the uplands fringed by mountain peaks clad in perpetual snow. Crossing regions where the climate is that of perpetual spring, you reach the higher plateaus and mountain slopes, where heavy mists, piercing winds, and treacherous swamps make travel almost impossible at some parts of the year, although these districts lie on the main routes between eastern and western Colombia.

The mountainous area, composing about two-fifths of the whole country, runs nearly north and south in three great ranges, the Cordillera Occidental or western chain, the Cordillera Central, and the Cordillera Oriental or eastern chain, inclosing fertile river valleys and uplands of great extent. The vast plains or *llanos* lie east and south of the mountains, part being open pastureland watered by the streams which flow into the Orinoco, and part covered with immense unexplored forests, drained by the tributaries of the Amazon River.

The Difficult Journey to Bogotá

The rivers which run between the great mountain ranges afford the chief means of communication. On account of the engineering difficulties and lack of capital, railway development is still in its infancy. In the whole country there are less than a thousand miles of railway, consisting of short isolated lines which run inland from coast ports or connect important inland centers with the Magdalena River. This stream, which flows between the eastern and central ranges to the Caribbean, is the main natural highway of Columbia, and the fourth largest river of the continent. The only way of reaching the capital Bogotá, far in the interior, is by a difficult rail, river, and highway journey.

Besides the Magdalena River, which is navigable for more than 900 miles, the other chief line of communication is the Cauca, the main tributary of the Magdalena, flowing between the central and western ranges. On the Pacific side the one important river is the San Juan, which has, with its tributaries, about 300 miles of navigable channel. The San Juan near its source flows so near the Atrato, which also drains the Pacific side of Colombia but empties into the Caribbean just to the east of the Isthmus of Panama, that a canal 400 yards long across the water-parting would give through water communication between the Atlantic and the Pacific. Naturalists have been led to surmise that such a communication once existed, from the occurrence of certain peculiar varieties of fish in both rivers. The upper valley of the Cauca, one of the most fertile regions of the republic, is connected by rail with Buenaventura, the chief Pacific seaport. Of the Amazon River system, the most important tributaries in Colombia are the Napo, the Yapura, the Rio Negro, and the Putumayo, the last-named being the scene of atrocities connected with rubber-gathering which roused the civilized world some years ago.

Of the population, which is estimated to be about 5,000,000, about ten per cent are classed as whites. The rest are native Indians, negroes, and mixtures of these three races. The bulk of the population live in the great temperate and cold plateaus, rather than in the hot and unhealthful coast regions, which are chiefly populated by negroes. Some of the natives of the mountains are still untouched by civilization and are dangerous to travelers.

Bogotá, although situated only a short distance north of the Equator, has a cool pleasant climate, for it lies 8,500 feet above the sea on a fertile table-land surrounded by the snow-capped peaks of the Andes. The public buildings are handsome, but because of frequent earthquakes the private houses are rarely more than one story high. With about 140,000 inhabitants, Bogotá is, as far as its wealth permits, a center of culture, maintaining a university founded in 1572, an academy of fine arts, a fine public library, a national observatory, a natural history museum, and a large botanical garden. It has been called the "Athens of South America." The desire of the people for education is shown by the fact that Bogotá supports 40 daily newspapers. It has modern street-cars, electric lights, and telephone service. Despite the fine example set by the capital, nearly 90 per cent of the people of Colombia can neither read nor write.

Colombia is a rich mineral country, abounding in alum, amber, amethysts, antimony, asphalt, coal, petroleum, copper, emeralds, gold, iron, lead, limestone, magnesium, mercury, platinum, potash, salt, silver, and soda; but the difficulties of transport prevent development of these resources. In the course of three centuries Spain took out of Colombia $300,000,000 of precious metals, and most of the world's emeralds today come from that country. The forests contain the rubber tree, ivory palm, bamboo, aloe, brazilwood, cinchona, fustic or dye wood, indigo, logwood, sarsaparilla, and tolu balsam. On the higher levels the crops of the temperate zone are grown; on the coast bananas and other tropical fruits, the cacao tree (from the seeds of which both cocoa and chocolate are made), coffee, tobacco, cotton, sugar cane, and rice. On the plains great herds of cattle are pastured. Coffee, hides, bananas, and Panama hats are the chief exports.

The Wild Life of Colombia

The wilds of Colombia are noted for the number and variety of their animals. In the forests are found the jaguar and puma, many species of monkeys, two kinds of bears, the tapir, the opossum, sloths, and armadillos. The last are esteemed as an article of food, along with the iguana, a large lizard. In the lakes and rivers are alligators, turtles, and quantities of fish. Among the reptiles are the boa-constrictor, the rattlesnake, the coral snake, and the deadly "fer-de-lance." The bird life includes the toucan, many species of parrots, beautiful macaws, and in the highlands, ducks and geese. In the hot districts are many large spiders, scorpions, centipedes, ants, locusts, mosquitoes, beetles, fleas, and other pests.

Under the name of New Granada, Spain conquered and colonized what is now Colombia in the course of the 16th century. For nearly 200 years the Indians were cruelly oppressed, great numbers of them being forced to work as slaves in the mines. In 1729 slavery was abolished. Revolution against Spanish misrule began in 1810, and in 1819 Simon Bolivar, the George Washington of South America, formed the Republic of Colombia, including what are now Venezuela and Panama. Soon after, the province of Quito (Ecuador) was added. But there were too many discordant elements and the unwieldy republic broke up in 1829. Colombia was then reconstructed as the Republic of New Granada, and took its present name, the Republic of Colombia, in 1886. Frequent civil wars have drained the strength of the country and disputes over boundaries with neighboring states have kept affairs unsettled. When in 1903 the department of Panama seceded and became an independent state much ill feeling followed against the United States because of the aid it rendered the revolutionists (*see* Panama).

Colombia has a house of representatives and a senate elected by popular vote, and a president elected for a term of four years. Authority is powerfully centralized in the executive, which overshadows the legislature and judiciary. The president appoints and removes at will all the ministers and the governors of provinces. Subordinate officials down to the mayors of cities are in turn appointed by the governors, so all power is centered in Bogotá.

COLONIES. In the days of ancient Greece and Phoenicia, when small city states were the rule, colonists left the mother city like swarming bees to found a wholly independent new settlement. Such colonies were bound to the parent state only by religious and sentimental ties. Rome's colonies were primarily military in purpose.

The colonies founded by modern states, in the new worlds of America, Africa, and Australia, are largely settlements by emigrants seeking new homes. Such colonies remain more or less connected in government with the mother country. The closeness of the connection varies from the "crown colonies" of Great Britain, where the white population remains scanty or where—as at Gibraltar—military and naval reasons demand that the government shall be kept entirely in the hands of the home government, to the great self-governing dominions, such as Canada and Australia, which are practically new nations bound to the mother state only by ties of race, economic interest, and loyal affection.

The enormous increase in population and investment-seeking capital in European states led to a great increase in colonial expansion in the 19th century. The desire to secure markets for surplus manufactures led to much colonial rivalry among the great powers, and was one of the causes of the World War of 1914–18. Because the New World was closed by the Monroe Doctrine to new colonization, the rivalry centered in Africa and the weaker countries of Asia. (For lists of the colonial possessions of the leading governments, *see* the articles on the different countries.)

COLOR. Authorities on color tell us there are about a thousand distinguishable hues and more than 2,000,000 tints and shades appreciated by the normal eye. Color is the gift of light, for the various colors are produced by light waves of different lengths (*see* Light; Spectrum and Spectroscope). The colors that we see depend upon what effect the different light waves have upon our eyes; and it is possible, as in color blindness, for the same light to be seen as of different color by different persons. (*See* Eye.)

What Determines the Color of Things?

Objects do not possess a certain fixed color of their own, but depend for color upon the light reflected from their surface. Surfaces capable of reflecting all color rays appear red in red light, blue in blue light, and white in daylight in which all the color waves are present. Other surfaces are capable of absorbing all the light rays and reflect none. Such surfaces appear black no matter what light falls upon them. If part of all the color rays are reflected and part absorbed, the surface will appear gray. Leaves on plants appear green because they reflect the green rays and absorb all other light; but if a leaf is taken out of the sunlight and held under a red light it will appear black, because there are no green rays to reflect to the eye. Flowers are red, yellow, or blue, depending upon their ability to absorb certain colors and reflect others, and so with all opaque objects.

Transparent objects are colored by their ability to screen out certain rays. For example, glass is red when only the red rays pass through it. A transparent body which transmits all colors equally well, such as pure water in small quantities, is said to be colorless.

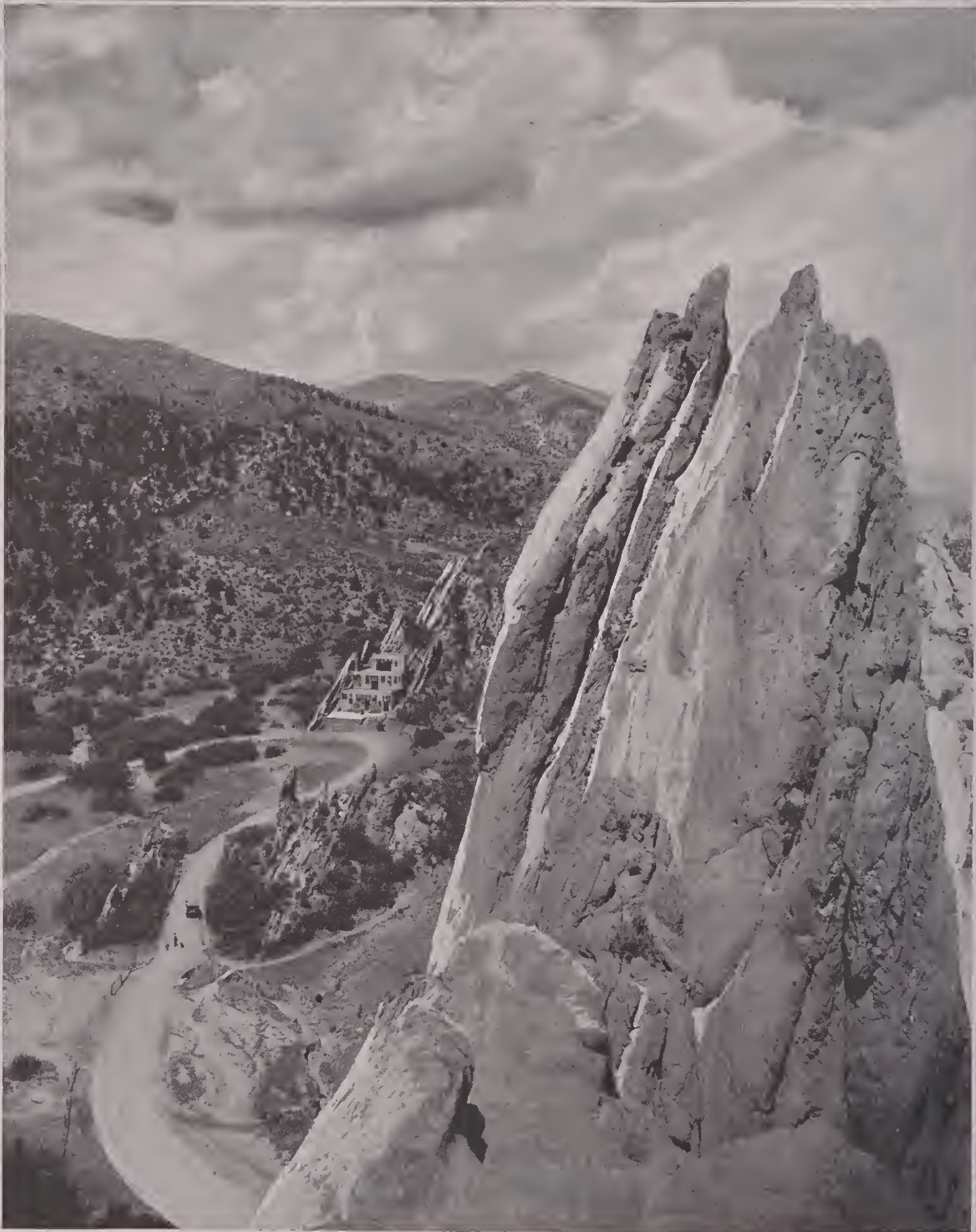
Colors differ in "hue," which is the difference between blue and red for example; and colors of the same hue may differ in "value" or intensity, due to difference in the amount of light they reflect; or in "purity," depending upon the amount of grayness in the colors. Adding white to a standard hue forms "tints," while adding black forms "shades."

Three Colors that Make All the Rest!

The artist's colors, called "pigments," and all the dyes, paints, and inks used by man, produce color because of their ability to reflect different light waves. From comparatively few color substances a great variety of colors may be made. Blue, red, and yellow are called "primary" colors, because from different combinations of these three colors all other colors may be produced. Thus, mixtures of blue and red produce purple; of yellow and blue, green; of yellow and red, orange; and so on. These are sometimes called "secondary" colors.

Red and greenish-blue, yellow and indigo blue, and similar color pairs are said to be "complementary" colors, because in each such pair one color "complements" or fills out the other. If you look fixedly at a bright red object and then quickly look away at a perfectly white surface you will see an indistinct image of the object in the complementary color of red, which is green. This simple but interesting experiment can be repeated with any of the other colors. It is based on the fact that the eye easily tires of one color so that when looking at the white surface the eye welcomes the other colors and responds less to the color which has produced fatigue.

NATURE'S LANDSCAPE ART IN COLORADO



No artist could have planned the scenery of Colorado better than Nature has laid it out for visitors coming from the East. With few small hills in front to lessen the effect, the first range of mountains rises from the plain, like a giant wall, stretching across the state from north to south. In this mighty wall there are half a dozen breaks like gateways. In one of these breaks is set the marvelous valley known as the Garden of the Gods, a corner of which we see here. Filled with strange forms, chiseled from outstanding rocks by natural forces, it is a veritable museum of Nature's sculpture. It can be reached by street-car from the nearby city of Colorado Springs, which lies on the eastern slope of the mountain wall, and splendid automobile roads within the valley lead to the spots of greatest scenic interest. Towering above the valley to the southwest is Pikes Peak. The building which shows against the outcrop of rock in the center of the scene is the "Hidden Inn," built to imitate the cliff dwellings in architectural style and colored red like the surrounding rock to keep it from being unduly prominent from a distance.

The TREASURE STATE *of the* ROCKIES

Colorado—the state of tumbled mountains, whose rugged beauties no region can surpass! For hundreds of miles are towering granite masses, clothed with pine and topped with snow that never melts. Foaming rivers pour tumultuously through stupendous canyons. Beneath the ground lie tremendous stores of gold and silver, for the enrichment of mankind. Truly Colorado is the Treasure State of the Rockies!

Extent.—East to west, 387 miles; north to south, 276 miles. Area, 103,948 square miles, about one-half of which can be used for farming and grazing. Population (1920 census), 939,629.

Natural Features.—Chief mountain ranges: Rampart, Sangre de Cristo, San Juan, Sawatch, and Elk (highest peak, Mt. Massive, 14,402 feet). "Parks": North, Middle, South, San Luis, Estes, and the Garden of the Gods. Principal rivers: Platte (North and South Platte), Arkansas, Rio Grande, Grand, and Green. Mineral springs at Manitou, Glenwood Springs, Hot Sulphur Springs, etc.

Products.—Gold, zinc, silver, coal, tungsten, radium, uranium, petroleum, etc.; hay, wheat, corn, oats, barley, sugar beets, fruit, potatoes, sheep and cattle; smelting, sugar manufacture, iron, chemical and lumber manufactures, meat packing, etc.

Chief Cities.—Denver (capital; about 260,000 population), Pueblo (43,000), Colorado Springs (31,000); Boulder, Greeley, Trinidad (about 10,000 each).

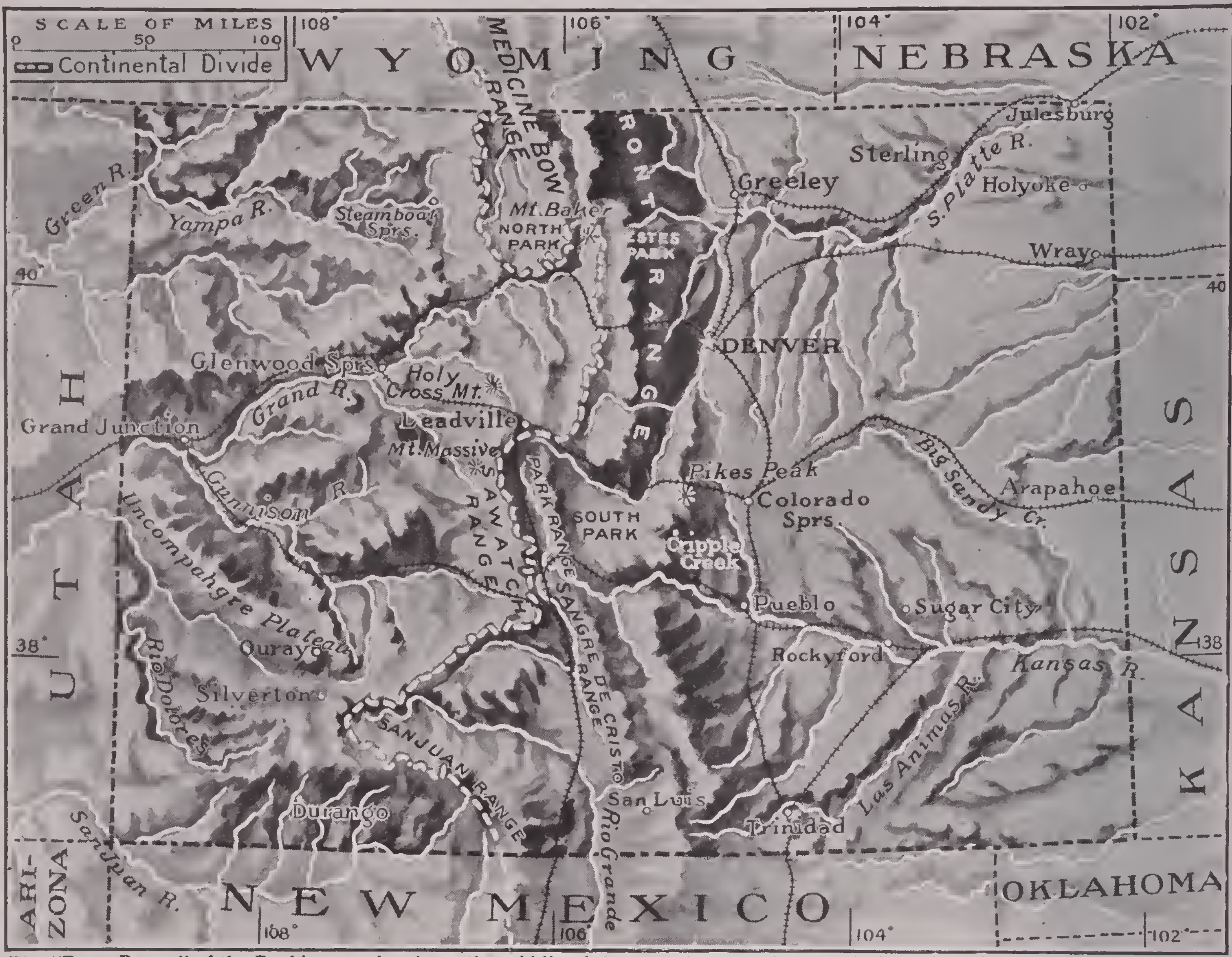
COLORADO (*kŏl-ō-rä'-dō*). One of Colorado's most famous parks is called the Garden of the Gods; this name might well be applied to the whole state. The early Indians must have thought it was created by giant sculptors and painters as a playground for superhuman beings. More than any other state Colorado is noted for its magnificent mountain peaks, its awe-inspiring canyons, its fantastic and vari-colored rock formations, and its great natural parks with their many sparkling lakes and rivers. It has about a thousand mountain peaks towering over two miles above sea-level, and of these 150 are over 13,000 feet high. There are 40 peaks higher than 14,000 feet, or more than twice as many as in all the other states of the Union. Two-thirds of the state's area ranges from 6,000 to 14,000 feet in elevation.

Colorado is a rectangle of oblong shape, cut through by the Continental Divide. About two-thirds of its surface is mountainous; the eastern third is part of the Great Plains region. The area is 103,948 square miles, making it the seventh largest in the Union. The capital is Denver, in the north-central part.

It was the hope of finding gold that first brought settlers to this wonderful country. In the summer of 1859 an army of 150,000 men crossed the plains between the Missouri and the base of the Rocky Mountains in Colorado. Great numbers of them became discouraged and turned back, and of the total number less than 20,000 remained. But these were men of sturdy stock, and they gave Colorado a vigorous start along the road to prosperity.

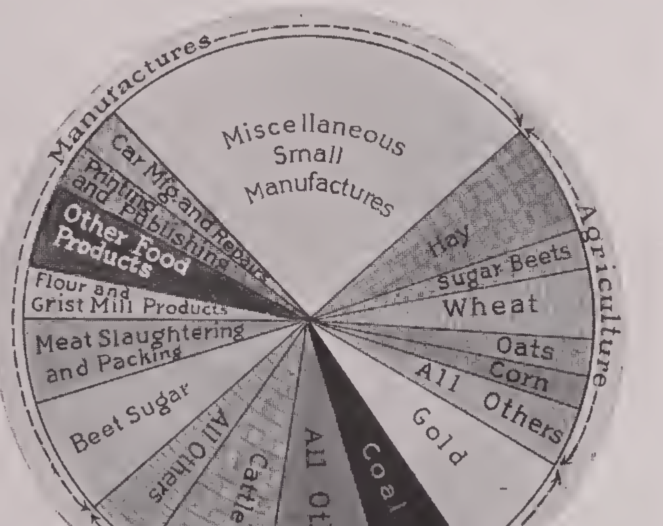
Today Colorado is one of the leading states in the production of precious and semi-precious minerals. But it is interesting to note that even in this great

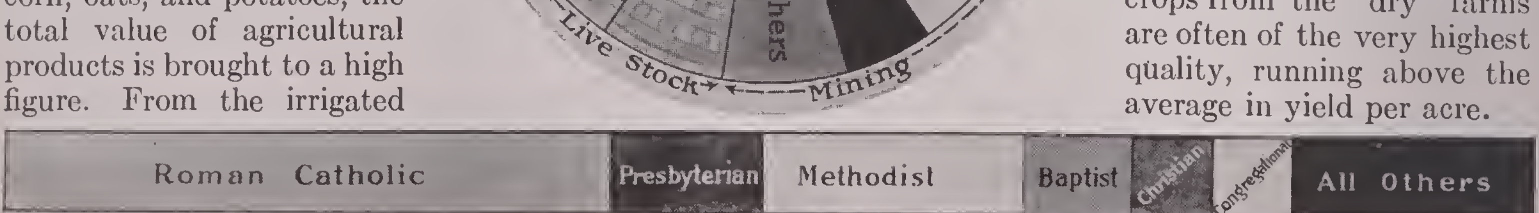
SEE HOW THE STATE IS DIVIDED BETWEEN MOUNTAIN AND PLAIN!



The "Front Range" of the Rockies running down the middle of the state from north to south rises abruptly, cutting the state in two. From this mountain barrier, level prairies stretch eastward into Kansas, broken only by a few shallow streams. To the west the Rockies continue across the border into Utah. Note the famous "Four Corners" in the Southwest, where Colorado, Utah, Arizona, and New Mexico meet at right angles.

mining state the value of agricultural products greatly exceeds that of its mineral output. For example, while in the last few years the total of all metal production has not exceeded $50,000,000 annually, the total annual agricultural production has been between $150,000,000 and $200,000,000. In the sugar-beet industry Colorado leads the United States. When we add such crops as wheat, corn, oats, and potatoes, the total value of agricultural products is brought to a high figure. From the irrigated districts apples and other fruits are shipped all over the United States, the Rocky Ford cantelopes having an unsurpassed renown. While there is a great deal of irrigated territory, "dry farming" is extensively practiced. This means the selection of crops and seeds especially adapted to dry territory and the cultivation of the soil in such a way as to conserve the scanty natural moisture. The crops from the "dry" farms are often of the very highest quality, running above the average in yield per acre.





The sections of the circle show the relative value of Colorado's principal products. Notice that Colorado's agricultural output is much greather than her minerals. The divided bar shows the relative number of people in the leading religious denominations.

THE BEAUTIFUL "QUEEN CITY OF THE PLAINS"

This is a view of Denver's principal business district looking southeastward from the main railway station. The State Capitol can be dimly seen in the distance. The nearer dome, slightly to the right, surmounts the Court House.

Here is a near view of the Capitol, standing on Capitol Hill in the heart of one of Denver's fashionable residence districts. On one of the steps leading up to the main entrance is a brass plate indicating that the top of that step is exactly one mile above sea-level.

Though gold is the chief mineral, large amounts of iron, lead, copper, zinc, tungsten, silver, and coal are also mined. Colorado is almost the only state which possesses large deposits of carnotite ore, from which uranium and radium are obtained, Paradox Valley, in western Colorado, furnishing the chief supply.

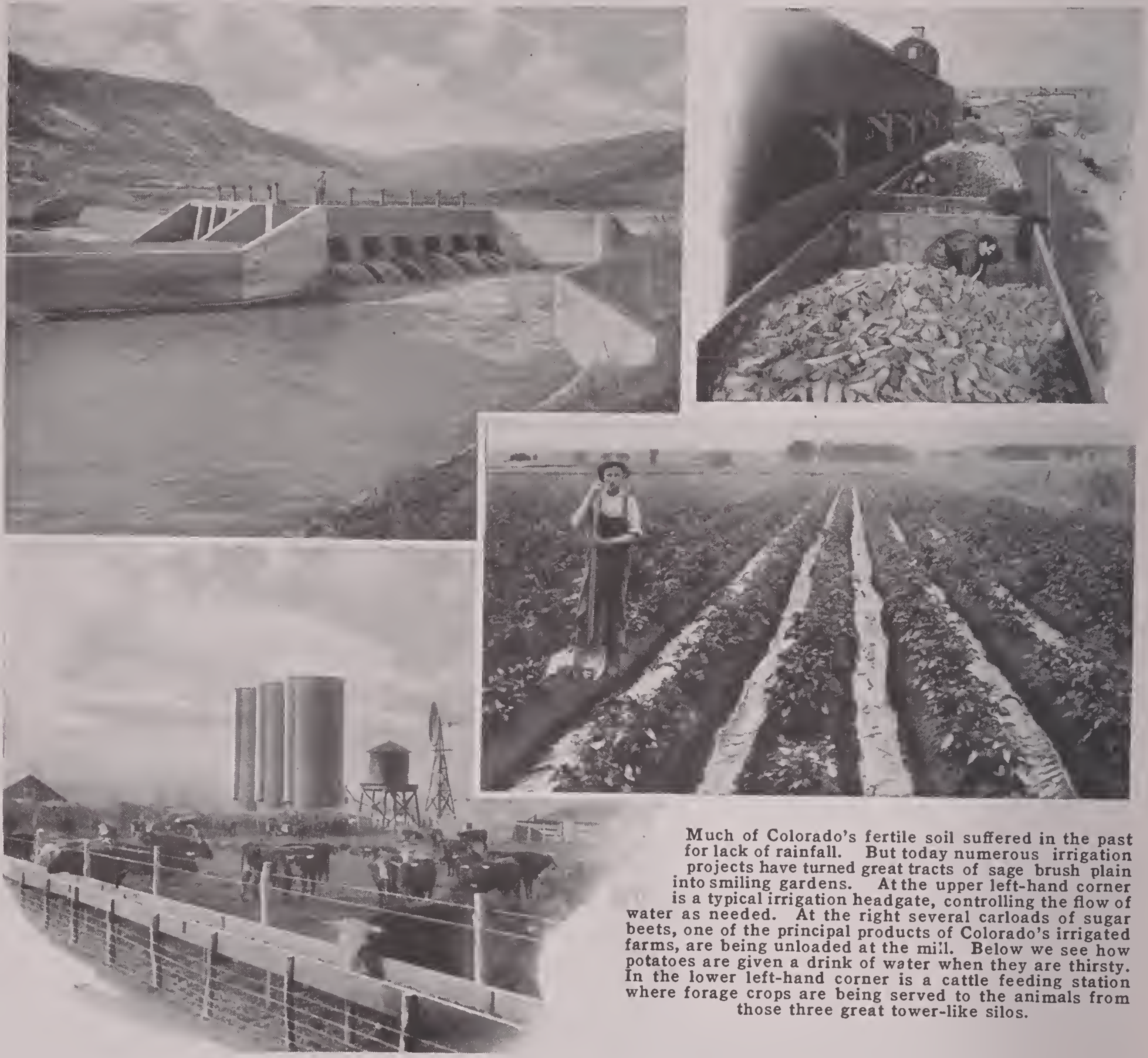
Colorado's coal deposits are almost inexhaustible, and it ranks eighth among the coal-producing states. In anthracite it is second. The coal fields are found on both sides of the Rocky Mountains, but those on the western slope are more important in quantity and quality. With such an abundance of coal and raw materials, industries, such as smelting, meat packing, and flour and sugar milling, flourish.

The growing of sugar beets requires a large amount of hand labor, much of which has been recruited from Russia, while the need for coal miners has brought into the state many immigrants from the north and south of Europe and from the British Isles. Thus, while the early settlers and the gold seekers, aside from a few Spaniards and Mexicans, were nearly all American stock, the population today includes about 40 per cent of foreign birth, chiefly from the British Isles, Germany, Italy, Russia, Austria, Sweden, and Denmark.

Lying near the Continental Divide are Colorado's great natural parks. These are huge plateaus, partly wooded but mainly grasslands, and usually surrounded by mountain ranges. The largest of these, San Luis, in the southern part of the state, has an area almost equal to that of Massachusetts, and is supposed to be the basin of a prehistoric inland lake. The other great parks are called simply South, Middle, and North Park, and are like San Luis in natural formation.

Estes Park, one of the loveliest of the smaller valleys, is the place where Enos Mills, the writer and naturalist, built his cabin, and from which he started

HOW COLORADO GETS CROPS FROM ARID LANDS



Much of Colorado's fertile soil suffered in the past for lack of rainfall. But today numerous irrigation projects have turned great tracts of sage brush plain into smiling gardens. At the upper left-hand corner is a typical irrigation headgate, controlling the flow of water as needed. At the right several carloads of sugar beets, one of the principal products of Colorado's irrigated farms, are being unloaded at the mill. Below we see how potatoes are given a drink of water when they are thirsty. In the lower left-hand corner is a cattle feeding station where forage crops are being served to the animals from those three great tower-like silos.

out alone and on foot to explore the Rockies. It has become a national park, and is a favorite summer resort for vacationists. Another of these parks is the Garden of the Gods, near Colorado Springs. It is famed for its many strange and beautifully colored rock formations, carved out through long ages by the wind and the weather. Two pinnacles standing together as if in the midst of a marriage ceremony are called the Dutch Wedding. The Balanced Rock is a great bowlder 71 feet high which keeps its upright position despite a seemingly insecure foundation; it often reminds the visitor of the leaning tower of Pisa.

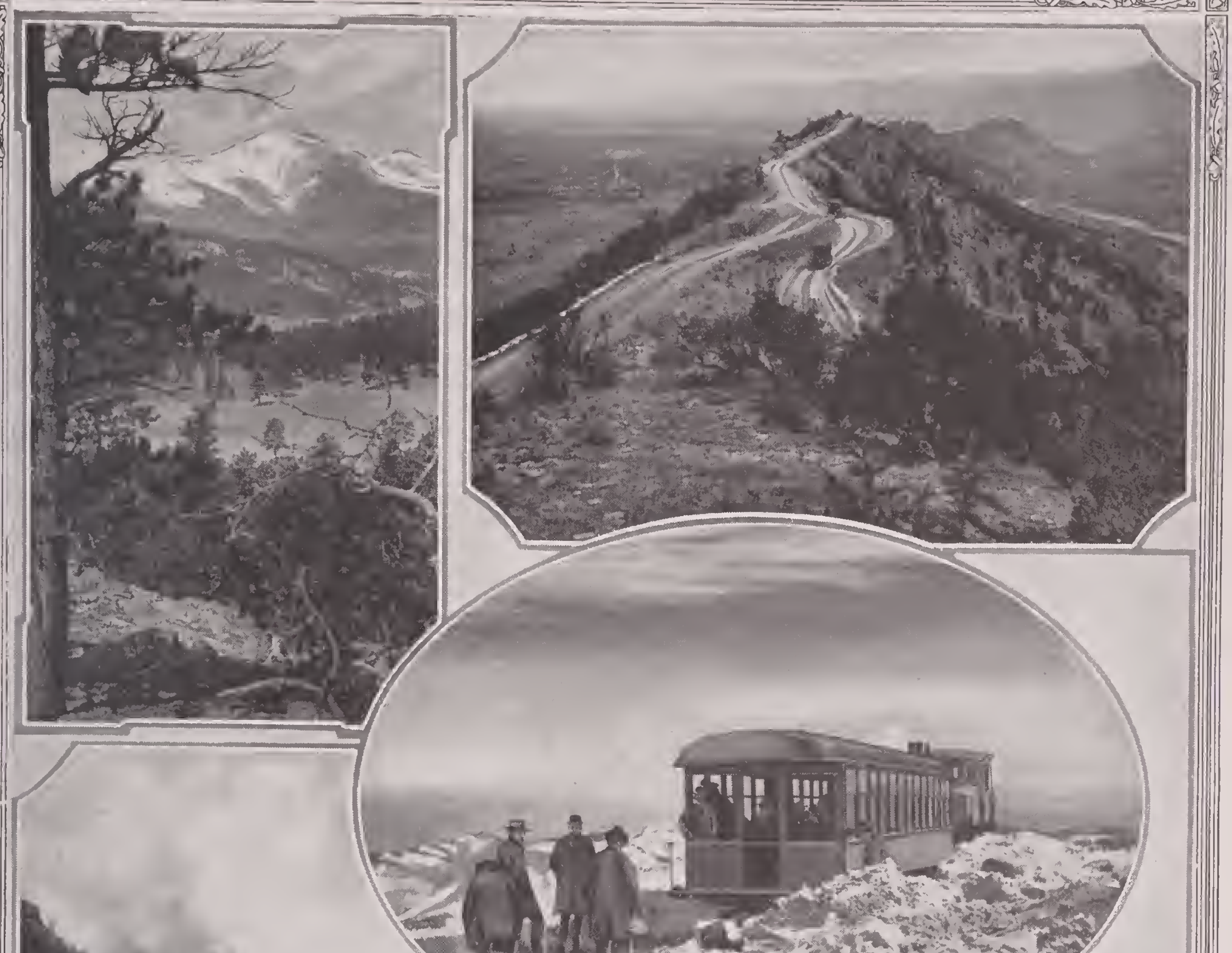
The great number and variety of mountain peaks and mountain ranges lend extraordinary grandeur to Colorado's scenery. The finest of the ranges are the Rampart, the Sangre de Cristo, San Juan, Sawatch, and Elk. Longs Peak (14,255 feet) and Pikes Peak (14,108) feet are probably the best known of the single mountains because they are along the trail that was taken by the first immigrants—a route now followed by transcontinental railways. The highest points in the state are the tops of Mt. Massive and Mt. Elbert, 14,402 feet high. The Mount of the Holy Cross, so called because of the ravines which make a perfect cross on its side, moved the old Spanish missionaries to awe and wonder.

The mountain districts of Colorado are dotted with forests, lakes, meadows, moorlands, and vine-like streams. In the forests are found elk and deer, mountain lions, grizzly bears, and mountain sheep.

The Great Roof Ridge of the Continent

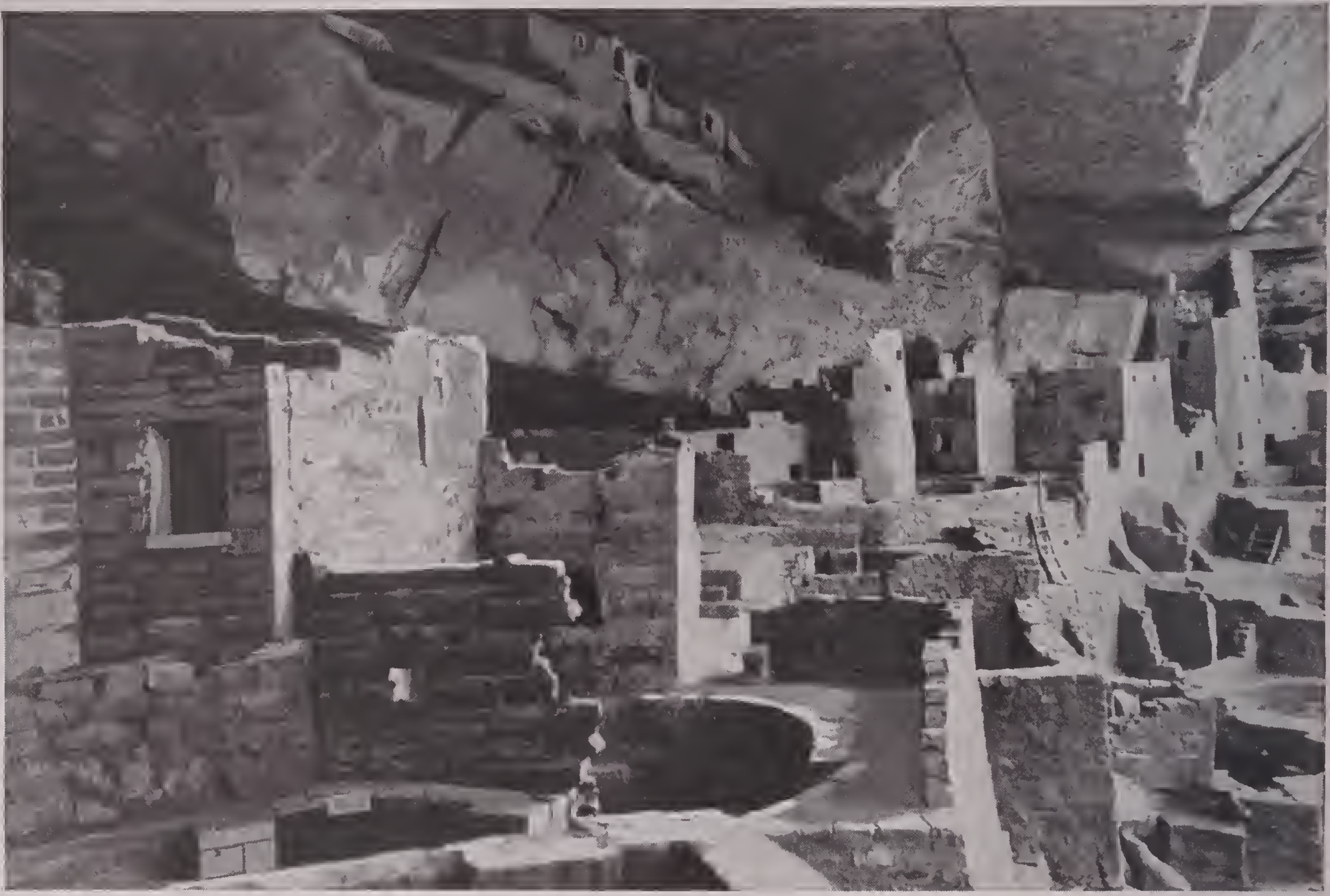
The Continental Divide (sometimes called the Great Divide) forms a natural watershed between the Atlantic and Pacific oceans. The Platte and Arkansas rivers flow to the east, the Rio Grande and a number of other rivers, which comprise what is called the

TAKING A CAR TO THE CLOUDS



Rising almost on the edge of the prairie country, Pikes Peak is one of the most impressive mountains in America. Visitors formerly could choose between three modes of ascent—walking, riding on burros, and taking the famous cog-wheel railroad. A new road now enables automobilists to drive up the mountain. Visitors to the Peak always find themselves in a winter atmosphere. The cog-wheel train in the oval has reached the summit, and its passengers are gazing out over the eastern portion of the state. The upper right-hand picture takes us to another famous bit of roadway in Colorado—the famous "Skyline Drive," near Cañon City.

THIS WAS A THRIVING CITY SEVERAL CENTURIES AGO



These battered buildings stand in a great niche upon a mountain-side in the Mesa Verde range of southern Colorado. Hundreds of years ago they sheltered a thriving little city. Exactly who its inhabitants, known as "cliff dwellers," were is one of the mysteries of history, for they were driven out by the desert Indians before the white race arrived on the scene.

Colorado System, flow to the south and west. Many of these rivers have cut beautiful canyons, or vertical gorges sometimes from 1,000 feet to a mile in depth; and when one has seen their glorious coloring, shifting through a hundred shades from dawn to dark, one realizes why the State was called Colorado, from a Spanish word meaning "reddish colored."

The mesa is likewise characteristic of the Colorado mountain country, the word coming also from the Spanish, and meaning "table," or "table-land." Ordinarily these mesas are flat-topped table-lands, raised above the surrounding territory, from which they are separated by steep descending cliffs. The Mesa Verde, in the southwestern part of Colorado—now a national park—is particularly interesting for the ruins of the Cliff Dwellers, a race of prehistoric Indians. One of the principal of these colonies looks like a ruined castle, and so is known as the Cliff Palace; but closer examination shows that it was the dwelling-place of a large tribe, perhaps as many as a thousand people. It occupies a great oval niche in the wall of a magnificent cliff. Some of the finest masonry characterizes the workmanship with which it is constructed. Investigators have not been able to determine when it was occupied, but it is certain that Indians lived there long before Columbus came to this land. The opening is about 425 feet long, 80 feet high, and 80 feet deep—a rather small space in which to crowd a thousand men, women, and children. The Indian tribes, when the white men came, were the Utes, the Cheyennes, the Arapahoes, the Kiowas, and Comanches.

Colorado in the Pages of History

The history of Colorado begins in 1541, when the territory was entered by Coronado traveling northward from Mexico. The eastern part of the state was acquired by the United States in the Louisiana Purchase in 1803, and the remainder as a result of the Mexican War, in 1848. Zebulon Pike explored the country and discovered the peak named after him, in 1806; and various other exploring expeditions were later sent out by the government, in one of which Kit Carson, the famous trapper and scout, acted as guide for Capt. John C. Fremont. But Colorado was still almost an unknown country when gold was discovered in 1858. After the gold rush, with which the towns of Cripple Creek, Pueblo, and Denver are associated, the people sought to establish a territorial government. Two names were suggested—that of Tahosa, "Dwellers of the Mountain Tops," and that of Jefferson. This is believed to be the only attempt to name a state after the great president. The country was actually governed for a while under the name of Jefferson territory.

IN THE HEART OF THE COLORADO MOUNTAINS

It is such scenery as this, coming at every turn of the mountain roads, which has made Colorado a paradise for the summer motorists. Rushing mountain streams fill the air with their music, accompanied by the eternal sighing of the pines.

Colorado is called the "Centennial State" because it was admitted to the Union in 1876, the year of the Philadelphia Centennial Exposition.

Though women were few in the early mining days, they now take a large part in public affairs. The office of state superintendent of public instruction is by common consent accorded to a woman, and the same is often true of the office of county superintendent of schools. There are many educational institutions of exceptionally high standing, including the State University of Colorado at Boulder, the Colorado School of Mines at Golden, the University of Denver, Colorado College at Colorado Springs, the State Teachers' College at Greeley, and the College of Agriculture at Fort Collins.

Colorado is sought by invalids because of its mild dry climate and medicinal springs. Some of the most noted are at Manitou, Cañon City, Idaho Springs, Glenwood Springs, and Hot Sulphur Springs.

COLORADO RIVER. The principal river of the region between the Rockies and the Sierra Nevadas is the Colorado, which rises as the Green River in northwestern Wyoming and flows into the Gulf of California. Since several American rivers are called "Colorado," from the Spanish word meaning "red," this river is often called "the Colorado of the West."

The Colorado is remarkable for two natural features: first, the famous Grand Canyon (*see* Grand Canyon); and, second, its habit of overflowing along its lower course. Before emptying into the Gulf of California, it flows between dike-like banks above the surface of the surrounding land. In 1904 it overflowed and refilled an ancient lake bed in California, creating the "Salton Sea."

COLUM'BIA RIVER. With the Yukon and the Colorado rivers, the Columbia is one of the largest American streams whose waters reach the Pacific. It is also one of the greatest salmon streams in the world, carries much sea-borne and inland commerce, and is famous for its scenery. It rises in the Rockies of British Columbia, flows through Washington, separates that state from Oregon, and empties into the Pacific after a course of 1,400 miles. Its mouth forms an inlet from 3 to 7 miles wide and 35 miles in length. The main branches of the Columbia are Snake River and Clark Fork. There are many falls and rapids, so that, although it is navigable for some 660 miles, freight has to be carried by railroads past the various breaks of the river.

COL'UMBINE. Clad in "red and yellow petticoats," this gypsy-like wild blossom dances with elfin charm to the rhythm of the breeze, or gracefully nods and curtsies low from the edges of overhanging rocks, welcoming us to the flower festival of spring. The columbine plant, sometimes incorrectly called "honey-suckle," grows from one to two feet high on sandy ledges in open woods, where the soil is sparse, its roots often barely covered with earth. It is found from Nova Scotia southward to the Gulf States, and in the Rocky Mountains. Emerson calls it "the rock-loving columbine." From April until July its five-spurred dangling blossoms flirt gaily with the ruby-throated humming birds that flash from group to group draining the nectar from each inverted cornucopia. In the pantomime shows which have come down from the Middle Ages, Columbine (from *columba*, a dove) is the gay fairy-like dancer courted by Harlequin. Perhaps the pretty dancing columbine flower was named for this coquettish maiden. Though red on the outside, the blossoms are lined with yellow and have long stamens and pistils forming a golden tassel that protrudes beyond the tips of the petals. Each year these gay charming flowers grow scarcer, for the plants are easily uprooted by careless persons in their eagerness for a bouquet. Because of its frequent occurrence in the Rocky Mountains, the columbine has been chosen as the state flower of Colorado.

Scientific name, *Aquilegia canadensis;* it belongs to the Crowfoot family (*Ranunculaceae*). Flowers 1 to 2 inches long, irregular, and solitary, with 5 cone-shaped petals tapering into slender, round-tipped spurs which are united below by 5 flaring sepals; 5 slender pistils and numerous stamens projecting below the yellow corolla. Stem branching, 1 to 2 feet in height, and smooth or covered with fine hairs. Leaves light green above and whitish underneath, divided into 3 or more lobes with rounded notches.

THE FAIRY DANCER

The gay Columbine nods and curtsies to the breeze from the Atlantic to the Rocky Mountains.

The GENOESE WHO FOUND *the* NEW WORLD

How Dauntless Courage and Persistence Gave America to a Doubting World, and How the World Repaid Columbus with Neglect—His Death in Poverty

COLUMBUS, CHRISTOPHER (1446?–1506). It was a beautiful sunshiny day in April 1493, and through the streets of Barcelona, in Spain, thronged with noisy and excited spectators, wound a strange procession. Six captive savages, gaily painted according to their barbaric custom and decorated with ornaments of gold, led the way. Then came attendants bearing bright-plumaged birds, strange plants, and the skins of unknown animals. And finally amid a cavalcade of Spanish soldiers rode a man of impressive height, his face grave, his cheek-bones high, his complexion fair but freckled, and his hair—once light—now turned to gray. This man was Christopher Columbus, who had sailed west to reach the Indies and had now returned to his patrons, Ferdinand and Isabella of Spain.

As a boy Columbus had helped his father, a wool-weaver in Genoa, Italy. At school he had studied Latin, mathematics, and astronomy, and had become a skilled maker of the maps and charts used by sailors. In his playtime he had watched strange ships coming and going in the busy harbor of Genoa, and had listened to the stirring tales of seamen until he decided that he too would be a sailor. And at an early age, as he tells us himself, he entered on his seafaring career.

We know very little of the early voyages of Columbus. When next we find him he is an experienced seaman, living at Lisbon, the capital of Portugal—that little country which, under the guidance of Prince Henry the Navigator, had become the chief center of the geographical knowledge of the time. Its captains were pushing their explorations farther and farther down the mysterious west coast of Africa, in their endeavor by sailing eastward around its southernmost point to reach the Indies. But as Columbus pored over the maps and charts left him by his father-in-law, one of Prince Henry's sea captains, he decided that the East could best be reached by sailing west; for he, with other learned geographers, well knew that the earth was a globe. Thereupon he determined to make a voyage to prove this.

Unknown and penniless, Columbus sought here and there the financial aid he needed to carry out his great idea. He presented his plans to John II of Portugal,—great-nephew to Prince Henry—to Henry VII of England, to two Spanish dukes, and finally to Ferdinand and Isabella of Spain. Many years he

HOW COLUMBUS CONVINCED A DOUBTING WORLD

What a discouraging task it is to convince doubters! For two years Columbus tried to convince the sovereigns of Europe that he could find land by sailing west, but without success. In 1486 the Spanish rulers sent him before a council at Salamanca to explain his idea. But Spain was straining its resources to expel the Moors from Granada, and he could not arouse enthusiasm for his project. So here he sits, wondering where to turn next, while doubters openly jeer at him.

At length, after years of effort, Columbus secured crews and ships and set forth. Then on the 12th of October, 1492, his many years of disappointment were crowned with success, for on the morning of that day he set foot on land found, as he had predicted, by sailing westward. Even at that moment he had a foretaste of the triumph which would be his when he returned to Spain with his news, for until a few days before the landing his crew had been on the verge of rebelling against what they thought was a mad scheme destined to end in death for all. No wonder he looked upward to thank God as he set foot on shore!

THE STRANGE PEOPLE FROM THE NEW WORLD

This picture shows Columbus before the King and Queen of Spain in April 1493, after his return from his bold journey across the "Sea of Darkness." With him he has brought native Indians whom he is exhibiting to the Court in proof of his great discovery. Columbus is here shown with a beard; the truth is nobody knows how Columbus looked, for there is no authentic portrait.

spent as a beggar at indifferent courts, dismissed as impractical by the wise, ridiculed by the foolish, betrayed by cupidity, deluded by false promises.

At last in the beginning of 1492 we see him setting out on foot for the court of France. On his way he stopped at the little monastery of La Rabida to reclaim his motherless little son Diego whom he had left there while he tried to secure aid from the Spanish king. Among the simple monks he found ready listeners to his story of unfulfilled ambition. The head of the monastery, who had formerly been Queen Isabella's confessor, was especially interested in Columbus and his plan, and he persuaded Columbus to remain there a few days while he wrote to the good queen, urging her not to let slip this golden opportunity of finding a new route to the Indies.

A Wild Crew on a Wild and Unknown Sea

Ferdinand and Isabella had now completed their conquest of Granada, the last stronghold of the Moors in Spain, and were ready to listen to Columbus' plans. The queen agreed to help him in fitting out an expedition, and at last—after busy months of preparation—he sailed on August 3 from the harbor of Palos in southern Spain.

For his momentous voyage Columbus had three small vessels, not much larger than modern fishing schooners. The crews of the three vessels numbered less than 100 persons in all, and they were mostly criminals and vagabonds who had been given their choice between imprisonment for their misdeeds and embarking on this dangerous adventure.

At first Columbus directed his course to the Canary Islands, where he spent almost a month in refitting his vessels. After he left these and embarked upon the "Sea of Darkness" his men began to murmur and to be afraid. Day after day the wind blew steadily from the east and they feared that if this continued they could never return home. Gradually they came to muttered threats. How easy it would be to push Columbus overboard some dark night, and who could say that it was not an accident?

To control these faint-hearted and criminal men, Columbus was forced to resort to deception, to threats, and to promises. By changing the entries in his log-book, he constantly made them think they were nearer home than they were. He pictured to them the wrath of the king if they should return empty handed. Finally he was forced to promise that if land were not sighted within three days he would turn back.

But by that time evidences were numerous that land was near at hand. Birds that were known never to go far from shore were seen about the ships in increasing numbers. Pieces of wood evidently carved by the hand of man, and a broken branch of a thorn tree with berries attached, floated by.

Sighting the New World at Dawn

That night Columbus ordered a strict watch to be kept for land. At 10 o'clock, as he stood peering out into the darkness, he thought he saw a tiny light in the distance, moving as though it were a torch carried on shore. At 2 o'clock on the morning of October 12 the booming of a cannon from one of the vessels told that land had been sighted. And at dawn all saw before them the low-lying shores of an island, to which Columbus gave the name of San Salvador. After cruising about among the West Indies and discovering the islands of Haiti and Cuba, which he thought were parts of "Cipangu" (Japan), Columbus returned triumphantly to Spain and was enthusiastically welcomed, as we have seen.

Three other voyages Columbus made to the New World. On his second voyage, in 1493, he discovered other islands of the West Indies and made the first settlements. On his third, in 1498, he coasted along the northeast shores of South America. From this expedition he was brought home in chains, accused of cruelty and misgovernment. After he had been cleared of these monstrous charges, he made a fourth voyage to the New World, in 1502, this time skirting the shores of Honduras, in Central America. But only misfortune attended this last expedition, and after an absence of two and a half years he returned to Spain with his single remaining vessel in a forlorn and disabled condition.

The Discoverer of a World Dies in Poverty

Columbus himself was now broken in body and spirit, and after two years of vain endeavor to secure some recognition from the ungrateful king (Queen Isabella died in 1504), the discoverer of the New World passed away in poverty and neglect in 1506.

Columbus had failed to find a route to India and this disappointment clouded his spirits. He never knew that he had discovered something infinitely greater than a route to the Indies and that he had made the most memorable voyage in history.

Some years after Columbus' death, his body and that of his son Diego were removed from their burial place in Seville to the cathedral of San Domingo in the island of Haiti. When that island was ceded to France in 1795, Spain and the Duke of Veragua, Columbus' descendant, removed the remains and those of Columbus' brother Bartholomew to Havana, in the island of Cuba. When the United States gained possession of Cuba, in 1898, the bodies were once more moved back again to Seville. There is no authentic portrait of Columbus.

COLUMBUS, OHIO. In the center of the state of Ohio lies its capital, Columbus, one of the most important railway centers of the United States, occupying a commanding position on a high plateau at the junction of the Scioto and Olentangy rivers. It was made the capital of the state in 1812, and four years later the legislature moved from its former seat at Chillicothe.

Columbus today is a progressive city with fine buildings, parks, and avenues. The city is laid out in the shape of a Maltese cross, with Capitol Square and the beautiful State House, built of native gray limestone in the Doric style, at the center.

The Ohio State University lies in the northwestern part of the city. It has 440 acres of campus along the Olentangy River, and nearly 7,000 students.

Because of its nearness to coal, iron, and natural gas fields, Columbus is important for its manufacturing. Here are many steel and iron works, and factories turning out machinery, carriages, shoes, drugs, and farm implements. In 1913 Columbus suffered severely from a flood in which 94 lives were lost, 4,000 homes flooded, and over $5,500,000 worth of property damaged. Population, about 240,000.

COMETS. Nothing startled our ancestors more than the unexpected appearance in the heavens of those peculiar objects with bright heads and streaming tails which we call comets, a word derived from a Greek word meaning "long haired." Even after the movements of the sun and the planets became understood, it was supposed that comets were malevolent vagabonds which prowled about the heavens bent upon evil. "God save us from the Devil, the Turk, and the comet," was a common prayer in Europe when the comet of 1456 appeared in the sky.

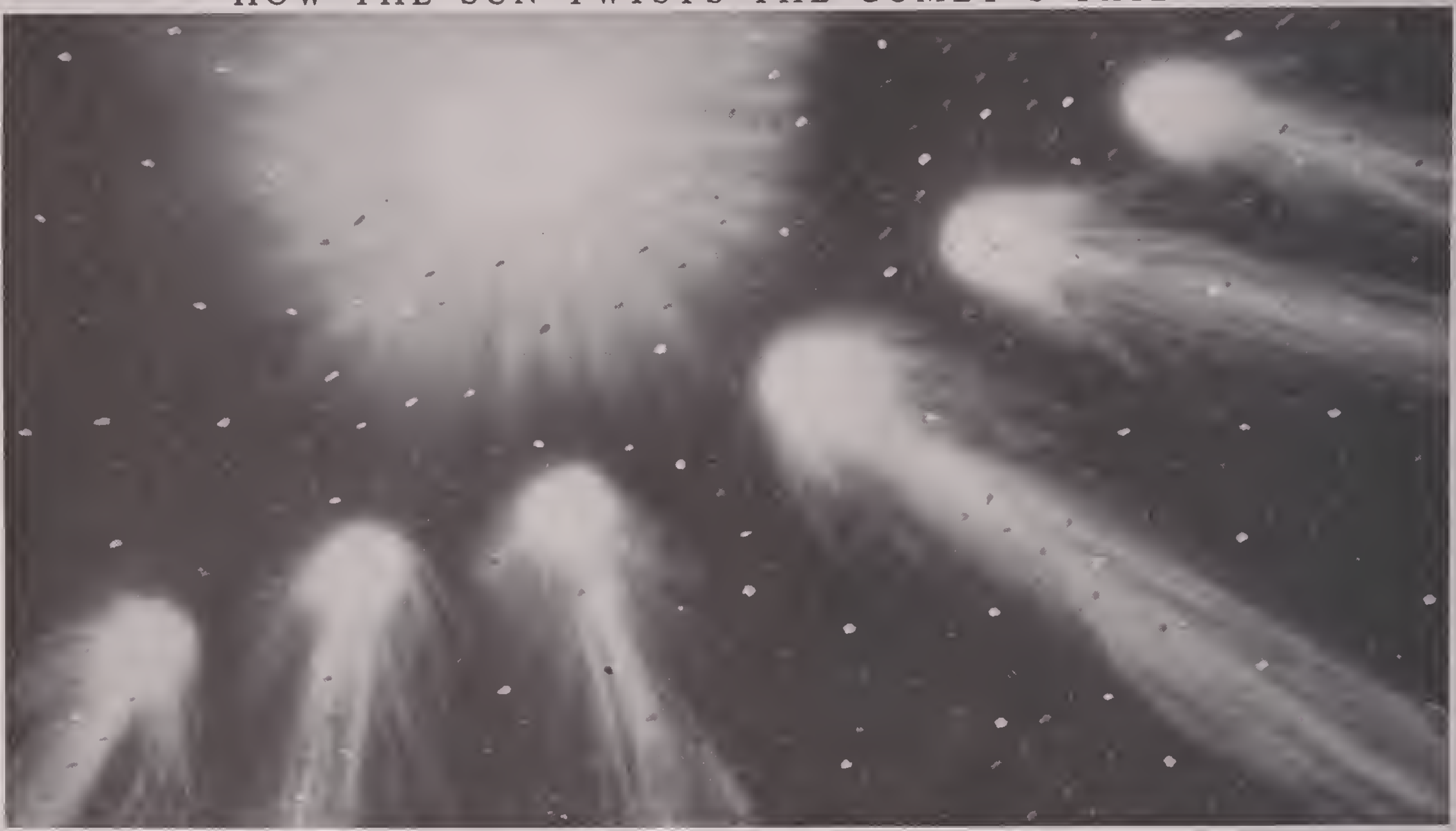
Though their origin and movements are still somewhat mysterious, the old superstitions about comets have all been exploded. Even a collision with one of these celestial wanderers would not ordinarily result in anything more than a shower of meteors. A collision in which the nucleus of the comet struck the earth might be more serious, yet such an encounter is only a remote possibility. On the other hand the earth has actually passed through the tail of a number of comets without any noticeable consequences. That was true of Tebbutt's comet of 1861, and also of Halley's comet in 1910.

It seems evident, therefore, that comets are largely gaseous, and this theory is confirmed by means of the spectroscope. Only the nucleus, which appears as a starlike center in the head, is thought to consist of relatively solid material. One theory is that the nucleus is actually a swarm of meteors surrounded by a cloud of gas and dust, and that the tail is a stream of gas thrown out from the head.

Peculiar Tricks of the Comet's Tail

The peculiarities of the tail still puzzle astronomers. It is not formed till the comet comes close to the sun. What is stranger, the tail *follows* the comet only when it is approaching the sun; as it leaves the neighborhood of the sun, the tail *precedes* the comet. In other words, the sun seems to exercise some strong repelling influence, which first drives out the tail from the head, and then keeps it on the side of the comet opposite the sun. In one case the tail can be compared to the trailing smoke of a locomotive, but when the comet is passing away from the sun its tail is like the rays of the headlight seen through a fog. One explanation is that the surface of the sun is negatively charged with electricity, and consequently drives out from the comet those particles which are also negatively charged, thus forming the tail and accounting for its peculiar positions.

HOW THE SUN TWISTS THE COMET'S TAIL



Here are six different positions of a comet, as it passes around the sun. No matter in what direction the comet travels, its tail always points away from the sun. Scientists have not succeeded in giving a satisfactory explanation of this curious behavior.

The motions of the comets themselves are nearly as much in doubt. It used to be held that the comet is really a celestial visitor which wanders into our solar system for a brief period in the course of a series of journeys from star to star. Astronomers are coming to believe, however, that most, if not all, comets are members of the solar system, and that they have been formed from the thin outlying masses of a vast nebula from which the sun and planets were evolved. At least 100 comets revolve in orbits that make it certain they will return to the sun. If these were once celestial vagabonds, they have now changed their habits and are merely permanent residents of the solar system given to long distance traveling.

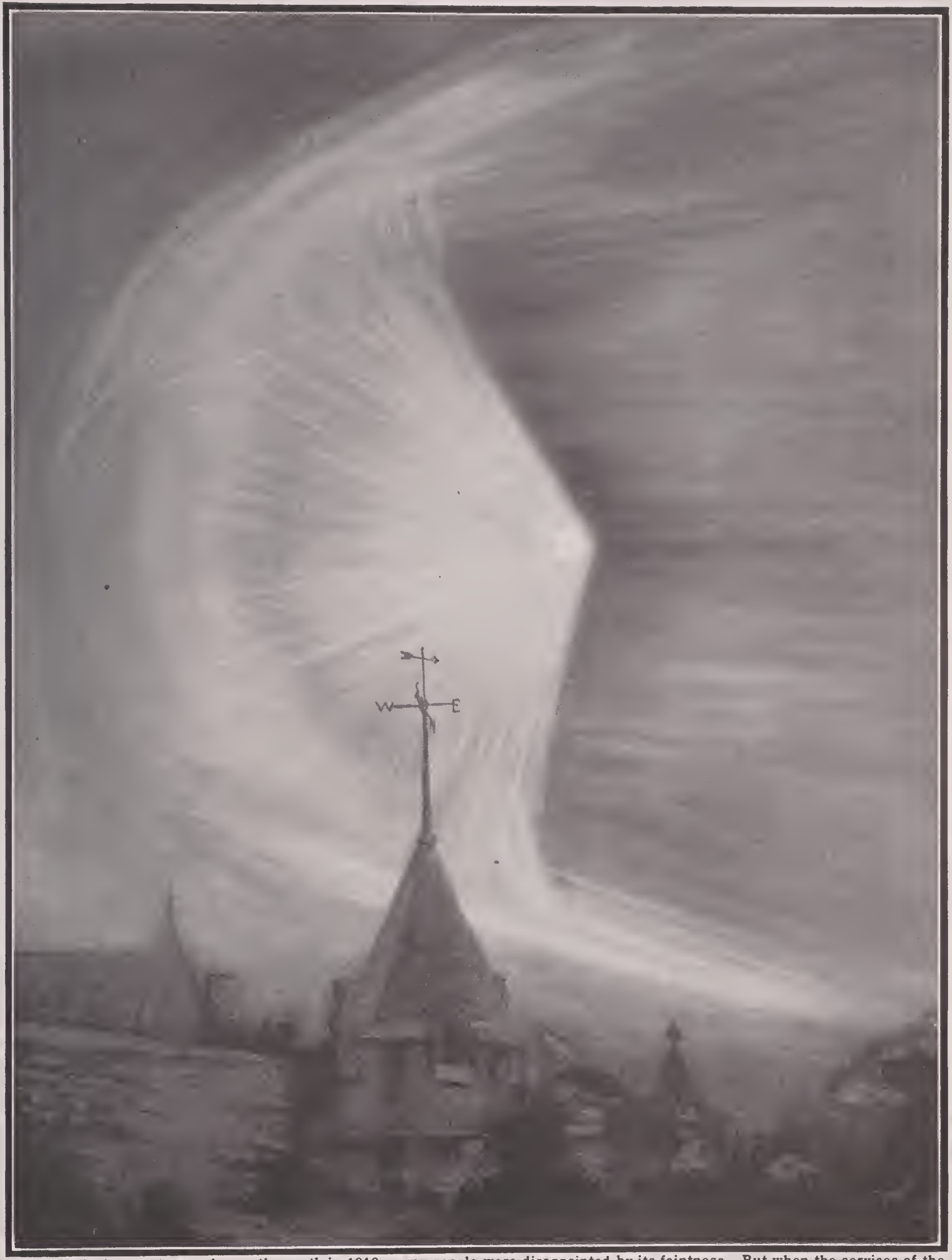
The Regular Visitors and the Transients

Comets which return over and over again are commonly called "periodic." The others are termed "unexpected." From three to ten comets are discovered a year, though most of them are invisible except through a telescope. Of the total number more than half are likely to be unexpected. If a comet never comes back, we do not need to assume that it has started on a journey to some distant part of the universe. On the contrary, the influence of the sun and its planets may have broken it up into meteors, or what is called cosmic dust.

The most celebrated of these peculiar wanderers is known as Halley's comet, after the famous astronomer whose prediction (in 1682) that it would return in about 75 years was verified, though Halley of course did not live to see his prophecy come true. Since then it has appeared regularly at about that interval of time. An earlier appearance was in 1066, just before the invasion of England by William the Conquerer. At its last appearance, in 1910, it was disappointingly dim, suggesting that it may be disintegrating. Other famous comets are Encke's, which returns every three and a half years; Biela's comet, which divided into two parts in 1846, and afterwards broke up into fragments too small to be seen (some reach the earth every year in November as shooting stars), and Donati's comet (1858), the brightest of the 19th century comets.

The nucleus of a comet varies in diameter from 100 miles to that of the earth, while the diameter of the head, or "coma," may extend anywhere from 10,000 to 100,000 miles. The length of the tail is enormous; even when it is shortest it has to be measured in millions of miles. The orbits of some of the planets are certainly elongated ellipses, and in such cases they return to the sun, but if the orbit is a hyperbola or parabola—that is, a broad unclosed curve—the comet goes out into space never to return. It may be visible from a few days to several months.

WATCH FOR HIM! HE'LL BE BACK IN 1986!



When Halley's comet passed near the earth in 1910, many people were disappointed by its faintness. But when the services of the telescope were enlisted, the comet showed all the interesting qualities that anyone could desire. This drawing, made at Greenwich Observatory, shows the curious fanlike sheet of light which surrounded its head. This heavenly wanderer makes a round trip every 76 years. Some comets move in "open orbits" and appear but once; others are like this one, which is a steady traveler, having been observed since 240 B.C.

Comets conform in all respects to the law of gravitation, and that means that the speed depends entirely upon their distance from the sun. At the earth's distance from the sun a comet would travel about 20 to 25 miles per second, depending on the nature of the orbit. The great comet of 1882 passed so close to the sun that its velocity for a short time reached the startling figure of about 400 miles per second.

TIES *of* TRADE *that* UNITE *the* WORLD

COMMERCE. What a narrow and uncomfortable life we should lead if it were not for commerce! Our ships and railway trains—like bees—gather honey from every land. The islands of the East are our spice gardens, India and China our tea plantations, South America and Australia our cattle and sheep ranges, South Africa our gold and diamond fields, and Europe our teeming manufactory, producing wares in which unite artistic skill and scientific knowledge.

Look at the breakfast table before you this morning. There are bananas from sunny Jamaica and sugar from the neighboring island of Cuba. Faraway Java produced the coffee, and the pepper came from the nearby island of Borneo. Northwestern New York state perhaps sends you your salt, and a farmer of North Dakota raised the wheat which the great mills of Minneapolis ground into flour for your morning bread. Your cocoa is made from the seeds of a tree which grew in Ecuador. Perhaps the table also grew as a mahogany tree in the West Indies.

A ship laden with wool sails from Australia to England. There the wool is spun into thread and woven into cloth. The cloth is perhaps colored with dyes from Germany, and sent to America and made into clothes for you in New York or Philadelphia; the shoes that you wear perhaps grew as hides on cattle that may have roamed the plains of Argentina or on goats in Asia or Africa, and were manufactured in Massachusetts. The curtains at your windows were probably woven either in England or in the mountainous country of Switzerland; while deft-fingered Irish women spun the flax and wove the linen of your tablecloth and napkins.

The quinine you take for a cold comes from a cinchona tree which grew in the forests of Peru or on the plantations of Ceylon; and the ends of the earth are ransacked for other substances used as medicines. (*See* Drugs.)

It has taken hundreds and thousands of people to bring these things to your door. In the United States alone about one-sixth of the whole working population are engaged in commerce—in getting commodities from the places where they are not needed to those where they are needed.

And what do the people who produced these goods get in return for all that they send you? To pay for these commodities the United States sends wheat and corn, cotton and tobacco, plows and automobiles. Foodstuffs and raw materials for industries, or partly manufactured products, are the chief goods which we export. So the world goes on, each section producing the commodities for which its climate, its natural resources, and its people are best adapted, and trading its surplus in turn for the things produced in other sections of the earth.

So important has the trading of commodities become that all governments aid in promoting the commerce of the country. All great nations station commercial agents, known as consuls, in foreign cities to assist in developing and maintaining trade relations. The consuls issue reports showing where there is a demand for the products of their nations, and in some cases the country even pays bounties to producers to encourage exports.

Schools and colleges, recognizing the importance of commerce, are offering courses in commercial geography, which teaches us the products of all sections of the world and the routes by which they are carried from one country to another. This study is also usually supplemented by the study of commercial law, or the legal side of business relations, and other related subjects.

By commerce all the world today is bound closely together so that "an injury to one" is often "an injury to all." The Civil War in America caused untold suffering and hardship in England because of the cutting off of the supply of cotton and the consequent unemployment of thousands of people in the English cotton mills. A tornado in Cuba decreases our sugar supply, a revolution in Mexico interferes with our supply of harvester twine, a law passed in Brazil increases the price of our coffee.

Because of commerce Columbus ventured out on an unknown sea, and for the same reason Vasco da Gama rounded Africa searching for a new trade route to the spices and the silks of the East. Those discoveries in turn caused Europe to face westward instead of eastward, and built the great commercial cities on the Atlantic—London, Lisbon, Antwerp, and Amsterdam—while the Mediterranean cities declined. It was commerce a little later which sent the French *voyageur* in his frail canoe up the streams and over the portages of Canada, and into its trackless forests in the dead of winter searching for valuable furs. Commerce even more than religion has led the white man to explore and develop the heart of savage Africa. Equally with the missionary it has carried western civilization into China and Japan, India and Burma. On the other hand, commerce has also been the chief cause of numerous wars and bitter international rivalries from the days of ancient Rome and Carthage to the 19th and 20th centuries. Napoleon recognized the dependence of nations on foreign commerce and sought to conquer his enemies by cutting off their trade by means of his "Continental System." The same idea underlay Germany's unrestricted submarine warfare in the World War of 1914–18, and the economic "blockade "of the Central Powers by the Allies. (*See also* Railroads; Transportation.)

Ocean commerce is carried chiefly by two classes of steamships—liners and tramps—both indispensable but performing very different services. Liners, keeping to set routes and schedules, connect all the principal ports of the world, carrying principally passengers, mails, and manufactured commodities—the latter being goods of comparatively small bulk and large value. The tramp steamer plies without a schedule—often without even knowing, when it leaves home, how many ports it will make or what parts of the world it will see before it returns. It voyages to and from the uttermost parts of the earth, wherever its owners can obtain a cargo, generally consisting of bulky, non-perishable goods, principally raw materials—coal, guano, phosphates, iron ore, wheat, corn, sugar, lumber, steel rails, etc. Argentina, for instance, requires 100 tramp steamships a month during November, December, and January to carry her grain to Europe; and they usually return loaded with coal from Great Britain.

Shipping conditions often dictate the trend of commerce in certain commodities. Thus, great Britain, which produces less coal than the United States, exports several times as much. Why? Because Great Britain imports large quantities of bulky foodstuffs and other raw materials. The tramp steamers which bring them, rather than depart in ballast, accept cargoes of export coal at low freight rates. The United States exports a larger proportion of bulky materials than Great Britain; outgoing coal, therefore, could command no such favorable freight rates from our ports as from British ports.

Line steamship traffic, like that of railroads, tends to fixed rates and monopolistic or "trust" conditions, while the tramp traffic is essentially competitive, with rates determined by what the traffic will bear at the moment. Thus, to take the exaggerated case of conditions before and during the World War, the rate on cotton from the United States to Great Britain, which was 25 cents a hundred pounds in July 1914, rose to $5 a hundred pounds in December 1916. Argentina, which ordinarily imports coal from Great Britain at a nominal freight rate, in June 1917, was importing it from the United States, paying $5 a ton freight. All such conditions, of course, enter into the prices paid for imported commodities.

COMPASS, MAGNETIC. Float a magnetized needle on a piece of cork on water, and the needle will soon come to rest in the north and south line. Instead of floating it on water, the magnetic needle may be suspended horizontally by its middle point with a fine thread, and the north and south line will be indicated. This "north and south" of the magnetic needle is in most places nearly the geographical north and south, but not exactly so. The magnetic compass used by sailors, explorers, and surveyors to find directions is merely an improved form of this simple magnetic needle.

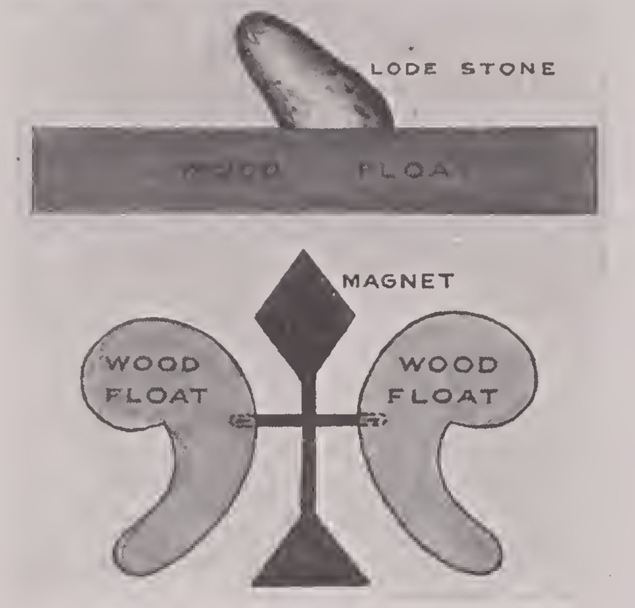
AN EARLY CHINESE COMPASS

Notice the Chinese characters on the dial. Some historians believe that the Chinese first invented the Compass.

In the common pocket compass the magnetized needle is mounted on a pivot in the center of a circular scale marked north, south, east, and west. You hold the compass so that the marked end of the needle points to the "north" mark on the scale; you can then read on the scale the direction in which you are going.

The mariner's compass is a more perfectly adjusted instrument. Instead of one needle there are several, attached to the under surface of a thin round sheet of paper or mica, called the "card," which is so supported at the center that it turns freely with the needles. The bearing is usually a tiny plate of agate let into the card, resting on a needle point of hard steel or some such hard alloy as osmidium-iridium. The card and needles are supported in a big hollow bowl or a ring of copper, since copper "damps" the vibrations of the needles—that is, causes them to come to a rest quickly. The same effect is obtained in some compasses by partly floating the card on a liquid. This "compass-box" in turn is supported on "gimbals," two copper rings so arranged that they allow the compass-box to tip freely in any direction and thus remain horizontal however the ship may pitch or roll. The whole apparatus is placed on a pedestal or "binnacle" in front of the steersman.

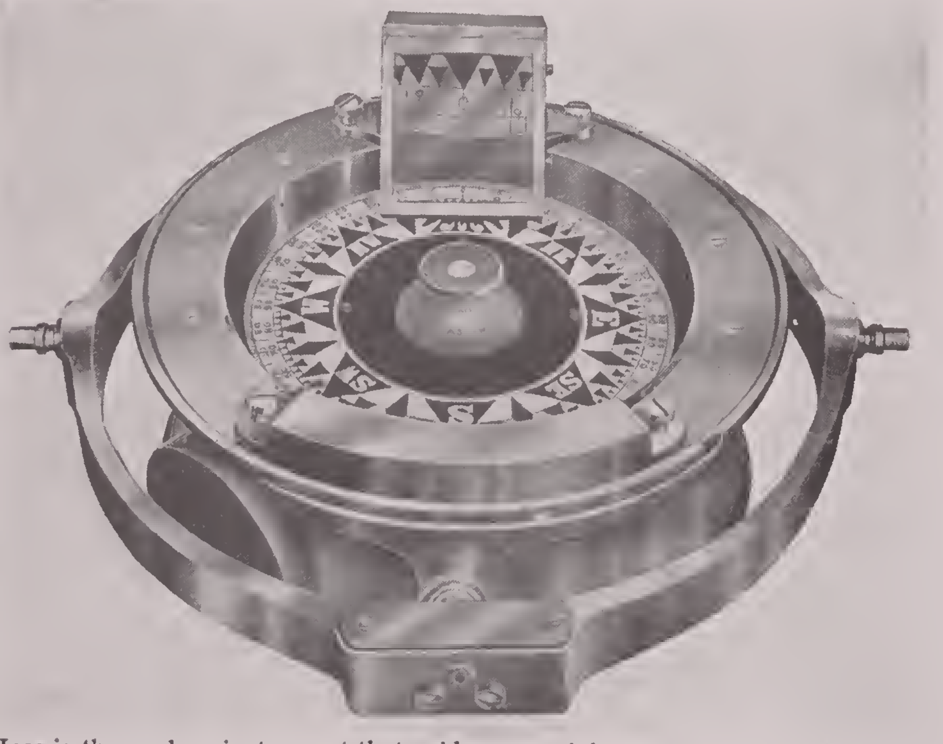
TWO PRIMITIVE COMPASSES



Before the pivoted compass was invented, bits of lodestone (magnetic iron ore) or magnetized needles were floated on blocks of wood or cork in a bowl of water.

The "cardinal points"—north, east, south, and west—are marked on the compass card, and the space between is further divided into half points, quarter points, eighth points, and degrees. A vertical black line is drawn on the inside of the compass-box exactly in line with the keel of the vessel, and as the ship changes its course the card swings so that the point marked north points directly to the north magnetic pole, the mark opposite the vertical black line indicates the ship's new direction. Thus, if the helmsman is to steer southwest, he turns the ship by means of the rudder until the point marked S. W. is exactly in line with the vertical line on the compass-box.

THE LATEST STYLE OF MAGNETIC COMPASS



Here is the modern instrument that guides our mighty ocean liners. An ingenious reflecting device enlarges the guiding marks, enabling the helmsman to steer with greater accuracy.

Since the magnetic poles do not exactly correspond to the geographical poles, the compass reading is not geographically correct and has to be corrected by complicated calculations. The difference between the compass reading and the corrected reading is called the magnetic variation. Allowance must also be made for the deviation of the needle caused by the attraction of iron used in the construction of the ship. This deviation is sometimes counteracted by placing bars of magnetic steel below the compass.

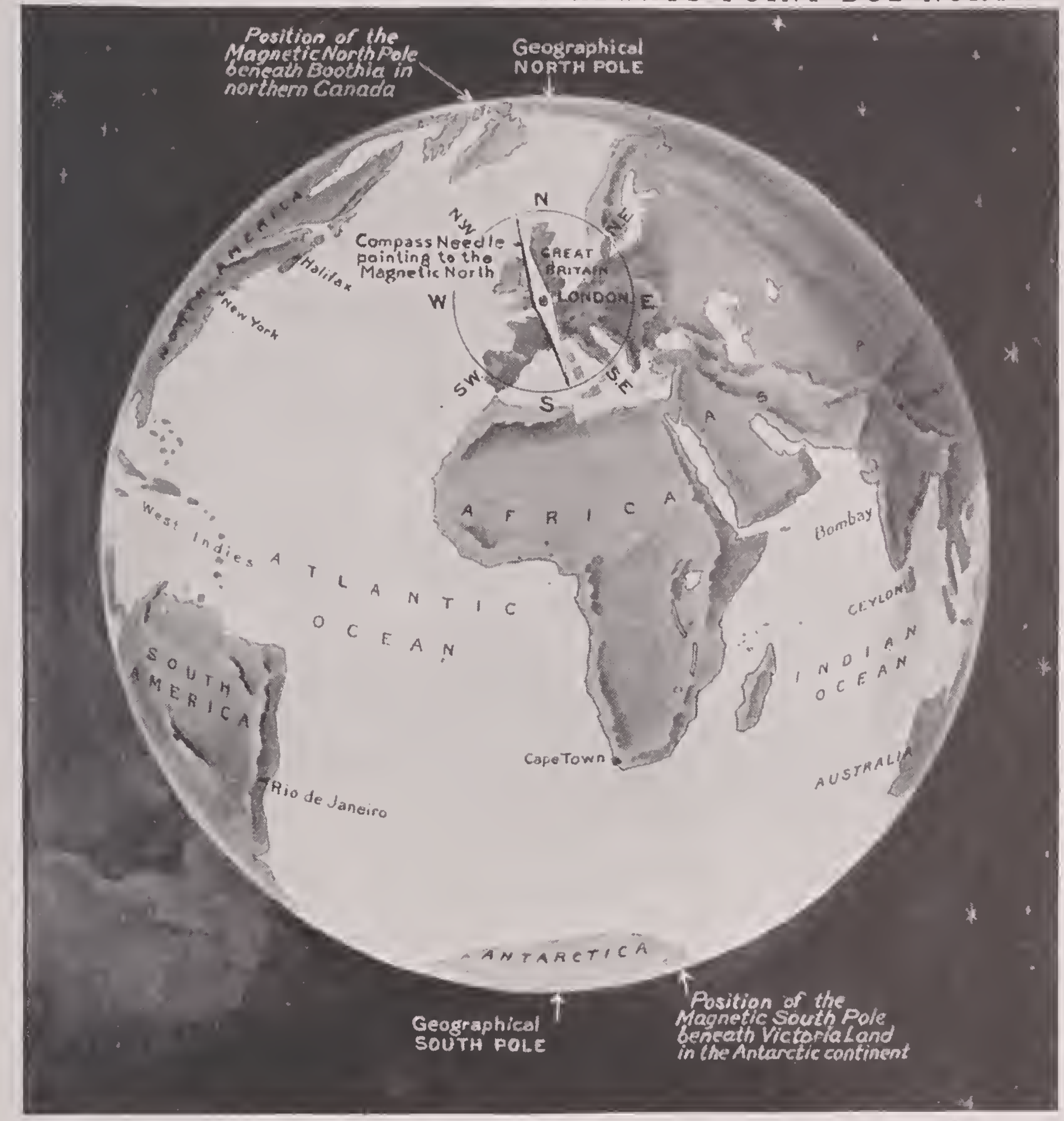
The introduction of the compass brought about a revolution in the art of navigation quite as momentous as the revolution which gunpowder made in the art of warfare. For thousands of years after men had learned the use of ships, they remained timid and unadventurous mariners, for the most part only skirting the shores and sailing by day. They had no instruments for determining their course and position at sea, and though they knew enough about the stars to get from them a general notion of the direction in which they were sailing, they had no way of making this knowledge accurate and precise. Without the mariner's compass, Columbus would never have dared to strike boldly across the Atlantic and discover the New World, and Vasco da Gama could never have rounded the Cape of Good Hope and discovered the sea route to the Indies.

Crude compasses were in use as early as the 13th century for sailing the Mediterranean. Probably the earliest form of compass is that described by an Arabian writer in 1282 who tells us that a magnetized needle, floated on water by means of a splinter of wood, was employed in the Mediterranean. The lodestone and its properties had been known in Europe and Asia at least 1,500 years before this date, but there is no authentic record of its use in navigation before the 13th century. By the time of Columbus the crude floating magnet had been improved into much the form of our modern compass.

In the modern surveyor's compass the needle swings over a disk divided into degrees, minutes, and seconds. By a system of levels, sights, and screws, it is possible to calculate directions with very great accuracy. Since 1911 a gyro-compass, which does not depend in any way upon the earth's magnetism, has been in use for naval vessels (*see* Gyroscope).

COMPASS PLANTS. The ordinary position of a leaf is approximately horizontal. In regions of intense sunlight and dry air, however, certain plants, such as the Australian eucalyptus, have learned to turn their leaves edgewise in order that they may be less exposed to the drying heat of the midday sun.

WHY THE COMPASS DOES NOT ALWAYS POINT DUE NORTH



"Due North" is the direction which runs toward the *geographic* north pole. But the compass needle points to the *magnetic* pole. Therefore at London, for example, the needle points to the westward of true north. Large masses of iron ore in the soil also produce deviations in many localities.

To obtain the needed light, the leaf turns its flat surfaces to the morning and evening rays. As a consequence, the leaves point either north or south, and hence such plants are called compass plants. The rosin-weeds of the prairies and the common prickly lettuce of waste ground are among the most notable of the compass plants of America.

COMPROMISE OF 1850. At the close of the Mexican War in 1848, the United States found itself in possession of vast stretches of territory in which there was no form of government. All that land which is now included in the states of New Mexico, Arizona, California, and Utah was still unsettled; but in 1849, following the discovery of gold in California, thousands of persons, chiefly from the Northern states, rushed to the gold fields. After a few months some 80,000 venturesome souls were to be found in the new mining region.

To maintain order and administer justice in these settlements an established government was necessary, and California asked to be admitted to the Union as a "free state"—that is, a state which would not permit slavery. It was largely due to the efforts of the South that the United States had entered the war with Mexico, since the South had been anxious to acquire more territory from which slave states could be formed. For Congress to grant California's request would be to deprive the South of a large part of this gain. Meetings of protest were held and Senator Toombs of Georgia declared in Congress, "I avow in the presence of the living God that if you seek to drive us from California, I am for disunion." The Northern States were equally insistent that slavery should not be extended. All but one state legislature of the North demanded that Congress should shut slavery out of all of the new territory.

Civil War seemed inevitable when Henry Clay, "the Great Pacificator," came forward with a compromise. There were other points also in dispute between North and South, and Clay proposed that each side yield something in order to preserve the Union. He suggested that the North allow New Mexico and Utah to organize as territories with no mention of slavery, and that the South be given a better fugitive slave law; while the South should permit the admission of California as a free state and the prohibition of the slave trade in the District of Columbia.

All spring and summer of the year 1850 the fight over these measures was waged on the floors of Congress. The aged Webster supported Clay's suggestions. He had been bitterly opposed to the war with Mexico, but that was now a thing of the past and his one aim was to perserve the Union. In his famous "Seventh of March" speech he declared that slave labor, he was sure, could never be profitable in New Mexico and therefore the North would be losing nothing by granting this concession. It was not necessary to exclude it by law of Congress; it was already excluded by "the law of nature." The anti-slavery sympathizers of the North felt that Webster had become a traitor to the cause of liberty. Their condemnation is shown in the poem 'Ichabod', by the Abolitionist poet, Whittier:

> From those great eyes
> The soul has fled.
> When faith is lost, when honor dies,
> The man is dead.
> Then, pay the reverence of old days
> To his dead fame.
> Walk backward, with averted gaze,
> And hide the shame.

After a fight of eight months Webster and Clay secured the passage of the laws which are known as the Compromise of 1850. This measure did not prove, as Webster had hoped, "a finality that would give peace to a country long distracted by the quarrel over slavery." It merely postponed the inevitable Civil War for another ten years. This ill-fated Compromise was the last service rendered by Webster and Clay to their country, for both died in 1852.

CONCORD, MASS. About 20 miles northwest of the city of Boston lies the straggling little town of Concord, famed for its historical and literary associations. It is almost 300 years old, having been settled in 1635; but its population is only about 6,500, and its chief importance today is in the hundreds of tourists who visit it each year. Here was fought one of the opening battles of the War for Independence (*see* Lexington and Concord, Battle of); here may also be seen the homes of a group of America's most famous authors.

In the "Old Manse," built by the Rev. William Emerson in 1765, Ralph Waldo Emerson wrote some of his best works. Nathaniel Hawthorne added to its fame by his 'Mosses from an Old Manse'. Near Emerson's later home on the Lexington Road stands "Orchard House," the home of the Alcotts, where Louisa M. Alcott wrote her famous stories and where her father, A. Bronson Alcott, lived while he conducted (1879–1888) the "Concord School of Philosophy" in a building near by. But the happy family life depicted in 'Little Women' refers to an earlier residence in a little house close by, known to them as the "Hillside." Hawthorne later obtained possession of it, and renamed it "Wayside." Meg's "Dovecote" in 'Little Women' is the Alcott cottage on Main Street, in which the family lived when they first came to Concord. On this same street is another house which this wandering family occupied for a time, and which later became the home of Henry D. Thoreau, the famous author of 'Walden'. All these literary friends—Emerson, Thoreau, Hawthorne, and the Alcotts—now lie in the beautiful Sleepy Hollow Cemetery, on the outskirts of the village.

CONCRETE. This is the age of concrete. With the aid of this artificial rock, harder and more durable than most kinds made in nature's laboratory, the art of building has been revolutionized. With this mixture of cement, sand, gravel, and water, great factories and office buildings are constructed that are virtually a single enormous hollow shell of concrete, and dams and embankments that are one great rock a mile or more in length. So easily is this material fashioned into any desired shape that it is now used for almost every conceivable type of structure.

We have houses and churches of concrete; sidewalks and roads and lamp-posts are often of concrete; and in the parks it is used for benches and fountains. Railroads use concrete for subways, bridges, trestles, stations, tunnel walls, culverts, viaducts, and even for cars and ties. The great locks and dams of the Panama Canal are all concrete. Farmers make barns, silos, watering-troughs, and sometimes fence-posts of concrete. Modern grain elevators, coal bins, ore bins, and oil tanks are made of concrete. It is used for foundations, piers, fortifications, laundry-tubs, roofing-tiles, building blocks, sewer-pipes, grandstands, and statues. Scarcely a building of any size is erected today without the use of concrete for foundations, flooring, walls, roofing, or other purposes. For making roads, concrete has proved of great and lasting value.

But the strangest of all its uses has been in shipbuilding. During the World War several vessels with hulls made of concrete were launched and proved successful.

In strength and resistance to fire, concrete properly reinforced with small rods of steel is equal if not superior to solid columns of steel. In durability it rivals granite. In cheapness it surpasses timber. For the ease with which it is fashioned it has no competitor. This wonderful material owes its existence to portland cement, which is the most important element in its composition. (*See* Building Construction; Cement.)

CONDOR. The mighty condor, the largest of all the vultures, and one of the largest of flying birds, makes its home thousands of feet high in the Andes of Peru and Chile, usually far above all animal life and at the extreme limit of vegetation. The full-grown condor has a wing expanse of from 8 to 11 feet and is about 3 feet long.

This much dreaded bird has all the disgusting habits of the vulture group, but when flying it is one of the most majestic of birds. "When the condors," says Charles Darwin, "are wheeling in a flock round and round any spot, their flight is beautiful. Near Lima I watched several for nearly an hour, without once taking off my eyes; they moved in large curves, descending and ascending without giving a single flap."

When an animal is dying on the plain the condor will hang watching so high in the air that its great bulk looks like a tiny speck. Suddenly it swoops straight down, like a rock, and from all directions others come to join it at the feast. The owners of flocks of goats and sheep wage constant war against these birds, for they will attack and kill lambs and kids and other small animals, and a pair of them have even been known to kill a bullock, when driven by starvation. A usual method of capture is to place a carcass in a small inclosure, and when the condor has gorged itself, gallop up and kill it, for it cannot ascend without sufficient room to run on the ground a few feet, and its meal has made it heavy and stupid. It is not recorded that a condor ever attacked a man. The birds have powerful beaks, but their claws, while they help in tearing the food, are not strong enough to carry away heavy bodies. (*See* Vulture.)

THE GREAT BIRD OF THE MOUNTAIN HEIGHTS

Grotesque looking creature, isn't he,—this great Condor with his huge expanse of wing? And what a beak and what claws! His home is among the dizzy peaks of the Andes.

The feathers of the condor are grayish black, though sometimes brilliantly black and there are sometimes white bars across the wings. The head and neck are naked and the skin is discolored and repulsive. There is a white frill of down at the base of its neck where the feathers begin. The elongated eye is purple and very brilliant. The head of the male condor has a sort of wrinkled and slender crest resting on the back part of the beak and forehead. The condor lays two white eggs on some inaccessible ledge, which are hatched in about seven weeks. The birds develop slowly and are not able to fly until they are about a year old, and usually remain with the parents a year or two longer. Scientific name, *Sarcorhamphus gryphus.*

CONEY ISLAND. How the staid Dutch burghers of old Manhattan would stare and gasp if they could view today this strip of sand, five miles long, which lies at the southwestern point of Long Island, near the entrance to New York harbor! In their day it was a desolate spot on the Brooklyn side of "East River," more than ten miles south of the Battery. Today it is within the metropolitan district of New York, and the greatest, noisiest, most crowded, gayest of the world's seaside resorts. Here is New York's most popular summer playground, where sweltering thousands crowd the beach, the bathing pavilions, open-air restaurants, dance halls, side-shows, toboggan-rollers, "shoot-the-chutes," scenic railways, "Ferris" wheels, observation towers, and dozens of other attractions.

Though "Coney Island" in popular speech means only this great playground of the people, the island proper contains three other sections which are playgrounds for the well-to-do. These are Sea Gate, at the western extremity, where there are many beautiful summer homes, a fine lighthouse, and the fine clubhouse of the Atlantic Yacht Club; Manhattan Beach, with its enormous and expensive hotels; and Brighton Beach, famous for its racetrack, its theater, and its hotels. Historically the island is interesting as the landing place of Henry Hudson in 1609.

CONFEDERATE STATES OF AMERICA. The secession of the Southern States and the formation of the Confederacy, following the election of Lincoln, was based upon the belief that the rights of the South, including its property in slaves, would not be protected under an anti-slavery president. The remedy was the right of secession, or withdrawal from the Union, which Southern leaders had long claimed remained to them after the surrender of other rights as sovereign states on entering the Federal Union. South Carolina was the first to act. A convention there, on December 20, 1860, declared that state no longer a part of the United States, and issued a Declaration of Independence, just as the 13 colonies had done when they broke away from England in 1776. In a short time Mississippi, Florida, Alabama, and Georgia followed South Carolina's example in issuing ordinances of secession. Early in 1861, Louisiana and Texas joined them.

On Feb. 4, 1861, representatives from six of the seceding states met at Montgomery, Ala., and formed the Confederate States of America. Their constitution, modeled on the Constitution of the United States, expressly sanctioned slavery. They elected Jefferson Davis as their first president, and Alexander Stephens as vice-president. War between the United States and the Confederate States began with the Confederate attack on Fort Sumter, April 12, 1861. Virginia, North Carolina, Tennessee, and Arkansas soon joined the seven who had already seceded; and Richmond, Va., became the Confederate capital.

The failure of the Confederate States to win recognition from foreign countries, and the effective blockade of their coasts by the Federal navy, foredoomed the South to failure. With the surrender of the army of Gen. Robert E. Lee, at Appomattox, the capture of their capital by Federal forces, and the arrest of their fugitive president, Jefferson Davis, the Confederacy ended. Each of the 11 States was again a separate unit, and as such had to accept the terms imposed upon it by the Federal government before it could again take its place in the Union on an equal footing with the other States. This period of reconstruction was completed in 1877, when the Federal troops were at last withdrawn from the South. (*See* Civil War and Reconstruction.)

CONFUCIUS (*kŏn-fū'shŭs*) (550–478 B.C.). One day, about 500 years before Christ, the Chinese philosopher Confucius and his disciples were on a journey and passed a graveyard where a woman was weeping and wailing at a new-made grave. Confucius sent to ask why she wept. She answered, "My husband's father was killed here by a tiger, and my husband also, and now my son has met the same fate." When they asked her why she did not leave so fatal a spot, she answered that in this place there was no oppressive government. "Remember this, my children," said Confucius to his disciples, "oppressive government is fiercer and more feared than a tiger."

In such teaching and with such wise sayings Confucius spent his life, trying to right the many wrongs of the feudal day in which he lived, and to bring men to a right mode of living and a veneration for the teachings of the wise men of old. He always said of himself that he was a "transmitter, not a maker"; and he collected and edited with the greatest care the poetry, the music, and the historical writings of the days still older than his own, which he thought the golden age.

Confucius laid no claim to being more than a man. Yet when he died he was venerated almost as a god, and temples arose to his name in every city of China and they stand today in undiminished splendor. His grave is yearly visited by many pilgrims, and his teachings are the most profoundly respected of the many faiths of China.

Though Confucianism is commonly called a religion, it is rather a system of ethics or good conduct, for Confucius did not talk of God but of goodness. Indeed, he taught nothing whatever about any god, saying simply, "Respect the gods, but have as little to do with them as possible." His entire attention was centered on making men better in this life, and his "analects" are wise saws or sayings not unlike the Proverbs in our Bible. He taught men to be honest, upright, faithful, and obedient to those in authority. His most famous rule of conduct is the "negative golden rule" which says, "What ye would not that others should do unto you, do ye not unto them." Every Chinese, particularly among the educated, knows scores of these sayings by heart.

In some ways the teachings of Confucius have been good for the Chinese people, who have of themselves very little native mystical or religious sense. But in other ways the country has been held back by his teaching that the past is more perfect than the present or the future, and that worship of one's own ancestors is an act of piety, and unquestioning submission to the state a supreme duty. As a result the Chinese usually think that what was good enough for his grandfather is quite good enough for his children.

"Confucius" is the Latinized form of this philosopher's Chinese name, which was *K'ung-fu-tse*, meaning the "Master Kung." He was born in what is now the province of Shantung, of illustrious lineage, though his father was poor and died when the boy was three years old. He was reared by his mother and proved a model son. After having held various small positions, he started at 22 on his real life work of teaching, leaving his wife and children in order to take up his great mission. When his mother died he spent 27 months in mourning in solitude. After some years of teaching and travel, he settled in Shantung and there spent 15 years, his worth being rewarded when he was 52 years old by an appointment as governor of a province. He performed his task so well that a neighboring governor became jealous and plotted his overthrow. Confucius then went into voluntary exile and wandered about for 13 years, returning home to his native state in his 69th year, saddened and discouraged. He died three years later. He had one son and two daughters, from whom today 40,000 Chinese claim descent. The followers of his teaching number almost 300,000,000, and are found not only in China but in all Asiatic lands.

CONGO RIVER. Less than 50 years ago the great Congo River of equatorial Africa was shown in the geographies as an insignificant stream, reaching only a few hundred miles into the interior. Today we know it as the fourth longest river in the world, and second only to the Amazon in the volume of the waters which it discharges. Its total length is more than 3,000 miles, and it drains an area of 1,600,000 square miles.

Lying in the very heart of the "Dark Continent," its basin is a vast region of trackless forests and endless swamps, of damp air and damp earth filled with countless flying, buzzing, crawling, stinging insects, of heavy odors from generations of matted and decaying vegetation. Here is the true home of the African elephant, of the gorilla, the chimpanzee, of gray screaming parrots, of the hippopotamus, the crocodile, and of many other strange creatures which revel in oppressive heat and in the rank wilderness of evergrowing plant life.

Its mouth, on the west African coast, was discovered by Diego Cam, a Portuguese, in 1482; but the difficulties of its ascent and the unhealthfulness of the climate caused it for three centuries to be shunned by all except a few hardy slave-traders. When its great inland course was finally traced, it was by expeditions entering Africa from the *east* coast. Dr. Livingstone, between 1867 and 1871, while exploring between Lakes Nyasa and Tanganyika, found a large river flowing to the north, which he thought to be the Nile. Five years later, Henry M. Stanley, exploring in the same region, gazed on the mighty stream, and following the course to the mouth proved it to be the Congo (*see* Stanley, Sir Henry Morton).

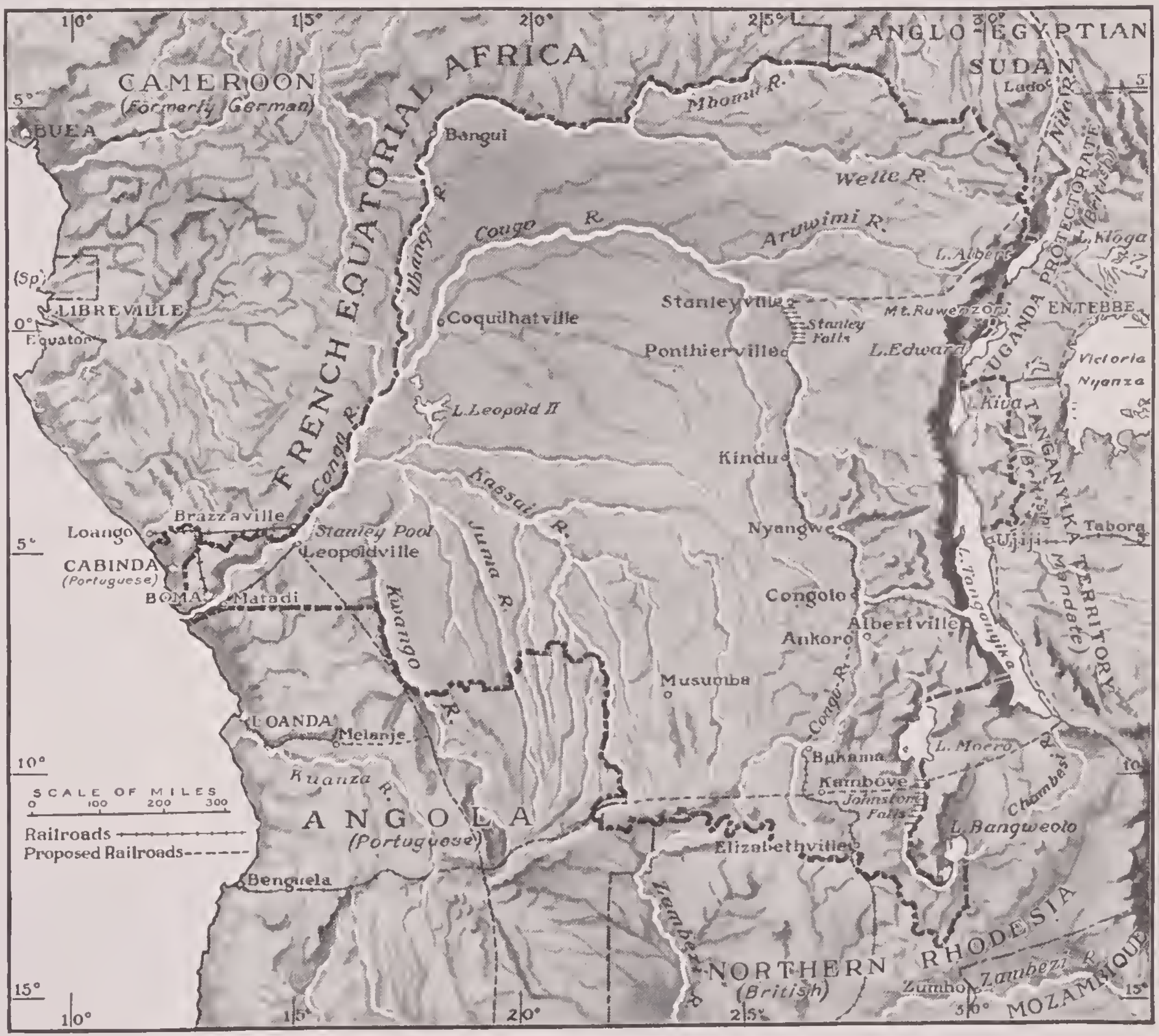
By natural features and adaptation to commerce, the Congo is divided into the lower, the middle, and the upper river. The lower river is navigable for steamers of 18-foot draught up to the first rapids, a distance of 110 miles. The middle river is unnavigable through the cataract region, extending 255 miles to Stanley Pool. The upper river, as far as Stanley Falls, is navigable for 1,068 miles for steamers of four-foot draught. Its main branches are the Kassai, from the south, and the Ubangi, from the north.

CONGO STATE. The founding of this great empire in Africa—now a colony of Belgium—was due to the foresight and personal enterprise of the Belgian king Leopold II. When Stanley returned from his great expedition in 1877, Leopold was the first to see the opportunity offered by the discovery of the Congo. Taking Stanley under his patronage, he performed the extraordinary feat of seizing this vast territory as virtually his own private property, and inducing the great powers of the world to consent to his keeping it (1885). Thus was formed the independent "Congo Free State," as it was called, with Leopold as its sole and absolute head. After a troubled administration, marked by numerous accusations that the natives were being crushed by taxes and cruelly enslaved, and that the guaranteed rights of foreign nations were disregarded, Leopold in 1908 transferred his 900,000 square miles of rubber plantations and "elephant farms" to the Belgian nation—the greatest private real estate deal in the history of the world. Leopold's work nevertheless had brought great development to a country which a half-century before appeared as a blank space on the maps. Today there are about 250 posts and stations, where more than 2,000 European officials are employed. Scores of steamers ply up and down the Congo. There are also about 5,600 miles of road, much of it suitable for motor traffic, more than 1,000 miles of railway, 2,000 miles of telegraph lines, and numerous wireless stations.

The principal industry of the colony is gathering the crude india-rubber from the rubber trees and vines, which are abundant in the great forests. Products next in importance are palm-nuts and palm oil, white copal (a tree gum used in making varnishes), cacao, ivory, rice, coffee, and ground-nuts, a relative of the peanut, from which a food oil is made.

The natives live chiefly by independent farming or are forced to work on the government plantations; they constitute the only laborers able to withstand the heat of this fever-stricken land. Their total number is placed between 7 and 15 millions.

THIS WAS ONCE A KING'S PRIVATE PROPERTY



This is the Congo State, formerly the personal property of King Leopold II, now a colony of Belgium. This vast area—larger than France, Germany, Italy, Greece, Spain, and the British Isles combined—is covered with tropical forests and inhabited by millions of negro savages.

The Belgian Congo has only a narrow outlet to the sea at the mouth of its great river. It is bordered on the northwest and north by French Equatorial Africa; on the northeast by the Anglo-Egyptian Sudan; on the east and southeast by lands under British control; and on the southwest by the Portuguese colony of Angola. The Portuguese also hold a tiny colony (Cabinda) on the northern shore of the Congo's mouth. At the close of the World War (1919) a portion of former German East Africa was added to the Congo Colony under a "mandate" from the League of Nations, as a result of Belgian aid in Africa against the German troops.

Among the principal cities of the Congo are Boma the capital, near the coast; Leopoldville; Stanleyville; and Elizabethville. As a result of German influence the name Congo is often spelled Kongo.

CONGRESS OF THE UNITED STATES. "All legislative powers herein granted shall be vested in a Congress of the United States, which shall consist of a Senate and House of Representatives." On this, the first section of the first article of the Constitution, is built the law-making body of the United States.

President Washington called the Senate, or upper house, the "saucer in which the tea of the House brew is cooled." The makers of the Constitution planned for this to be the more deliberative branch of Congress, and provided that members must be at least 30 years old and nine years a citizen of the United States, while members of the lower house need be only 25 years of age and seven years a citizen of the United States. The members of the Senate are chosen, too, for six years, and as their terms are so arranged that only one-third retire each two years, the Senate is practically a perpetual body. The small size of the body—only two senators from each state, so that even now there are only 96 members—also gives a very different character to it from the lower house, with its 435 members. The senators were at first supposed to represent the states rather than the people, and hence were chosen by the state legislatures until 1913, when the 17th amendment placed the election of senators in the hands of the people of each state.

The Senate is in many ways the most powerful factor in the government. The President and Senate may act in appointments and treaty-making without the assent of the House. The House and Senate by a two-thirds vote of each pass laws over the President's veto. But the President and House can do nothing without the concurrence of the Senate. As one of the branches of Congress it helps to make all laws of the United States, and in addition possesses some executive and judicial powers. In cases of impeachment it sits as a court of justice and tries Federal officers—even the President—when such officers are accused by vote of the lower house of "high crimes and misdemeanors."

Members of the Lower House.

The members of the House of Representatives are supposed to represent the people more closely than does any other branch of the government. Every two years they must return to their constituents to seek reëlection, and the whole membership may change at a single election. The membership is based on population, except that every state must have at least one member. After each census is taken the House revises the representation according to the population shown.

Senators and representatives alike are paid $7,500 a year, with allowances for travel, for stationery, and for clerk hire. The terms of representatives begin on March 4, following their election in November of the even-numbered years. But unless there is a special session of Congress they do not begin their work until the first Monday in December of the odd-numbered years, or more than a year after their election. This is the "long session" of Congress, which usually lasts until the late summer or autumn. The "short session" lasts only from the first Monday in December of even-numbered years to noon of the following March 4.

Frequently more than 40,000 bills are introduced in a session, but less than one in 50 of them ever become laws. Any member of either house may introduce a bill into the house of which he is a member. He does this usually merely by depositing it in a large basket known as the "hopper."

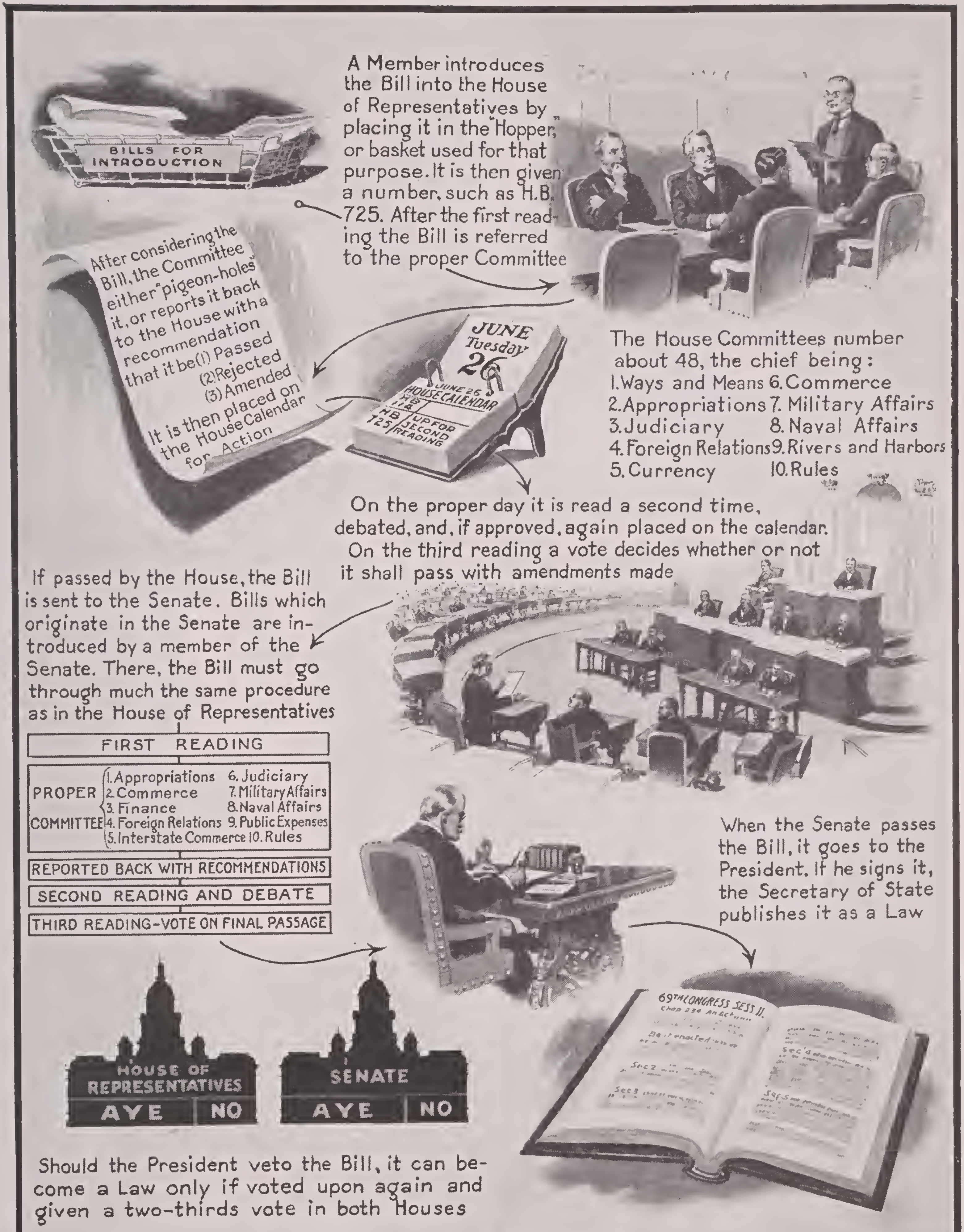
How Laws are Made

After a bill is presented in Congress it must go through the three readings customary in legislative bodies the world over. This procedure is copied from the practice of the British Parliament. In Congress the first reading is formal. The clerk announces the title of the bill and it is referred to the appropriate committee for consideration. Sometimes it is not easy to decide which is the "appropriate committee," for in the House there are about 60 standing committees and in the Senate about 75, besides select committees to consider special bills. Then, too, the whole house may meet as a "committee of the whole," in which a bill can be debated more informally than can be done in a meeting of the house. Persons interested in a bill are usually permitted to appear before the committee at specified times and argue for or against it; and the cabinet officers have become quite as much advisers of these committees as of the President. The fate of a bill is usually decided in committee, the great majority of bills introduced never being reported to the house at all. The real work of Congress is done in private in these committees, and today the public debate on a measure is "mainly a sham battle, the real one having been fought in committee."

If the committee decide to report a bill favorably, the entire text is read to the house at the time the report is given. This is the second reading. After more or less debate by the house, the third reading is had of the completed bill with its amendments (if any), and the final vote is then taken.

After the bill has passed the house in which it was introduced it goes to the other house, where the same procedure is followed. If it passes the second house on the third reading it must be sent to the President for his signature, and after that to the secretary of state, who files and publishes it. If the President vetoes the bill (*see* Veto), it may become a law if both houses pass it a second time by a two-thirds vote. Concurrent resolutions also require the President's assent, but not joint resolutions.

HOW A BILL BECOMES A LAW IN THE UNITED STATES



A Member introduces the Bill into the House of Representatives by placing it in the "Hopper," or basket used for that purpose. It is then given a number, such as H.B. 725. After the first reading the Bill is referred to the proper Committee

After considering the Bill, the Committee either "pigeon-holes" it, or reports it back to the House with a recommendation that it be (1) Passed (2) Rejected (3) Amended. It is then placed on the House Calendar for Action

The House Committees number about 48, the chief being:

1. Ways and Means
2. Appropriations
3. Judiciary
4. Foreign Relations
5. Currency
6. Commerce
7. Military Affairs
8. Naval Affairs
9. Rivers and Harbors
10. Rules

On the proper day it is read a second time, debated, and, if approved, again placed on the calendar. On the third reading a vote decides whether or not it shall pass with amendments made

If passed by the House, the Bill is sent to the Senate. Bills which originate in the Senate are introduced by a member of the Senate. There, the Bill must go through much the same procedure as in the House of Representatives

FIRST READING

PROPER COMMITTEE
1. Appropriations
2. Commerce
3. Finance
4. Foreign Relations
5. Interstate Commerce
6. Judiciary
7. Military Affairs
8. Naval Affairs
9. Public Expenses
10. Rules

REPORTED BACK WITH RECOMMENDATIONS

SECOND READING AND DEBATE

THIRD READING–VOTE ON FINAL PASSAGE

When the Senate passes the Bill, it goes to the President. If he signs it, the Secretary of State publishes it as a Law

Should the President veto the Bill, it can become a Law only if voted upon again and given a two-thirds vote in both Houses

To prevent hasty and ill-considered law-making, all legislative bodies must have an orderly method of procedure, and nearly all show the stages of first, second, and third readings derived from the English Parliament and followed by Congress. Parliament, however, makes much less use than Congress of such standing committees as are shown above. Besides these standing committees, special committees are occasionally appointed for special purposes.

All the proceedings and speeches in Congress are published by the government in the 'Congressional Record'. At first this was called the 'Annals of Congress', then the name was changed, first to 'Register of Debates', then to 'Congressional Globe', and in 1875 to the name the series bear today.

Scope of the Power of Congress

The laws and resolutions passed by Congress relate to foreign and interstate commerce, taxes, duties, and excises, naturalization and bankruptcy, coinage of money and establishment of standard weights and measures, the postoffice, patents and copyrights, inferior courts, the declaration of war and the maintenance of the army and navy and matters "necessary and proper" to carry out their other powers. This is the "elastic clause" which has given Congress control over many matters not contemplated by the fathers of the Constitution.

In addition to its legislative powers, Congress has the judicial power of impeachment, in which the House of Representatives acts as prosecutor and the Senate sits as a high court of justice (*see* Impeachment).

NUMBER OF CONGRESSMEN ALLOWED EACH STATE

State	Number	State	Number
Alabama	10	Nevada	1
Arizona	1	New Hampshire	2
Arkansas	7	New Jersey	13
California	14	New Mexico	1
Colorado	4	New York	43
Connecticut	6	North Carolina	11
Delaware	1	North Dakota	3
Florida	4	Ohio	24
Georgia	12	Oklahoma	8
Idaho	2	Oregon	3
Illinois	27	Pennsylvania	36
Indiana	12	Rhode Island	2
Iowa	10	South Carolina	7
Kansas	7	South Dakota	3
Kentucky	10	Tennessee	10
Louisiana	7	Texas	19
Maine	3	Utah	2
Maryland	6	Vermont	1
Massachusetts	16	Virginia	10
Michigan	15	Washington	6
Minnesota	10	West Virginia	6
Mississippi	7	Wisconsin	11
Missouri	14	Wyoming	1
Montana	2		
Nebraska	5	Total	435

The apportionment of Congressmen under the 1920 census is one representative to 242,267 population; this gives the states the number of representatives as shown above.

Unlike the British and Canadian Parliaments, and legislative bodies of other foreign countries, the legislative branch in the United States is sharply separated from the executive branch, though the assent of the Senate is necessary to the appointment of most high officials and to the conclusion of treaties, and Congress alone can declare war. The members of the cabinet are not, as in Great Britain and Canada, leaders and members of Congress, guiding and controlling its proceedings and responsible to it, as it is to them through the power of dissolution (*see* Cabinet). The result is that conflicts between the legislative and executive branches are frequent in the United States, while such conflicts are practically unknown in countries having the parliamentary form of government.

CONJUNCTION. Compared with the enormous number of nouns, verbs, adjectives, and adverbs in the English language, there are very few conjunctions. Nevertheless conjunctions are exceedingly useful words, and they save us a great deal of time. Suppose we want to say that John, Frank, and Mary each has a sled. If there were no conjunctions we could not make this statement clear without saying "John has a sled, Frank has a sled, Mary has a sled." But by the use of the little word *and* we are able to avoid all this repetition and make a single statement convey our meaning.

Conjunctions then are words which connect. They get their name from a Latin word meaning "to join with" or "connect." They may connect single words or entire phrases, clauses, and sentences. Those that connect elements of the same grammatical value or rank are called *coördinate* conjunctions. Those that connect clauses of different grammatical rank are called *subordinate* conjunctions; many of these are adverbs used as conjunctions, and so are also called *conjunctive adverbs* (*see* Adverb).

Besides merely connecting, conjunctions are used to express various relations. Coördinate conjunctions may denote addition (*also*, *and*, *moreover*); separation or choice (*either*, *or*, *neither*, *whether*); opposition (*but*, *however*, *whereas*, *yet*); result or effect (*so*, *therefore*, *thus*, *hence*). Subordinate conjunctions may denote time (*when*, *after*, *while*); place (*where*, *whence*); cause (*because*, *for*, *as*); condition or supposition (*if*, *though*, *unless*); purpose or result (*lest*, *that*, *in order that*); comparison (*than*, *so*, *as*).

Many conjunctions are used in pairs; as, *either—or*, *both—and*, *though—yet*, *so—that*, *not only—but also*. These are called *correlative* conjunctions.

One of the most common mistakes is the use of *like* to introduce a clause. *Like* is not a conjunction, and should never be followed by a subject and predicate. It is correct to say "He looks like a strong boy," but not "He looks *like he is* strong." In the second sentence the conjunctive phrase *as if* should be used instead of *like*. *Like* should always be followed by a noun or other substantive.

Humble words are conjunctions, never able to stand alone; yet they are one of the most important aids to clear expression. Unless a writer masters these small "thought carriers" he will never achieve a lucid and logical style. They play a great part in legal documents, and many a great lawsuit has turned upon a single "but."

In Busy CONNECTICUT'S Hills and Valleys

Up in the northwest corner of Connecticut is a beautiful region of New England lakes and hills where this fine old state meets New York and Massachusetts. Here is a view in this charming district.

Extent.—North to south, 76 miles; east to west, 95 miles. Area, 4,965 square miles. Population (1920 census), 1,380,631.
Natural Features.—Highest point, Bear Mountain (2,355 feet), in northwestern corner. Principal rivers, Housatonic (tributaries, Naugatuck and Shepaug), Connecticut (Salmon and Farmington), Thames (Quinebaug, Shetucket, Natchaug, Willimantic). Frontage on Long Island Sound, from Byram River (west) to Paucatuck River (east), about 100 miles. (Principal islands of the Sound belong to New York.)
Products.—Brass and bronze goods, textiles (silk, wool, cotton goods, felt, and knit goods), firearms, cutlery and hardware, rubber goods, silver and plated ware; hay, tobacco, garden produce, poultry, and dairy products.
Chief Cities.—New Haven (about 165,000), Bridgeport (145,000), Hartford (capital, 140,000), Waterbury (92,000), New Britain, Meriden, New London, Norwalk, Norwich, Stamford.

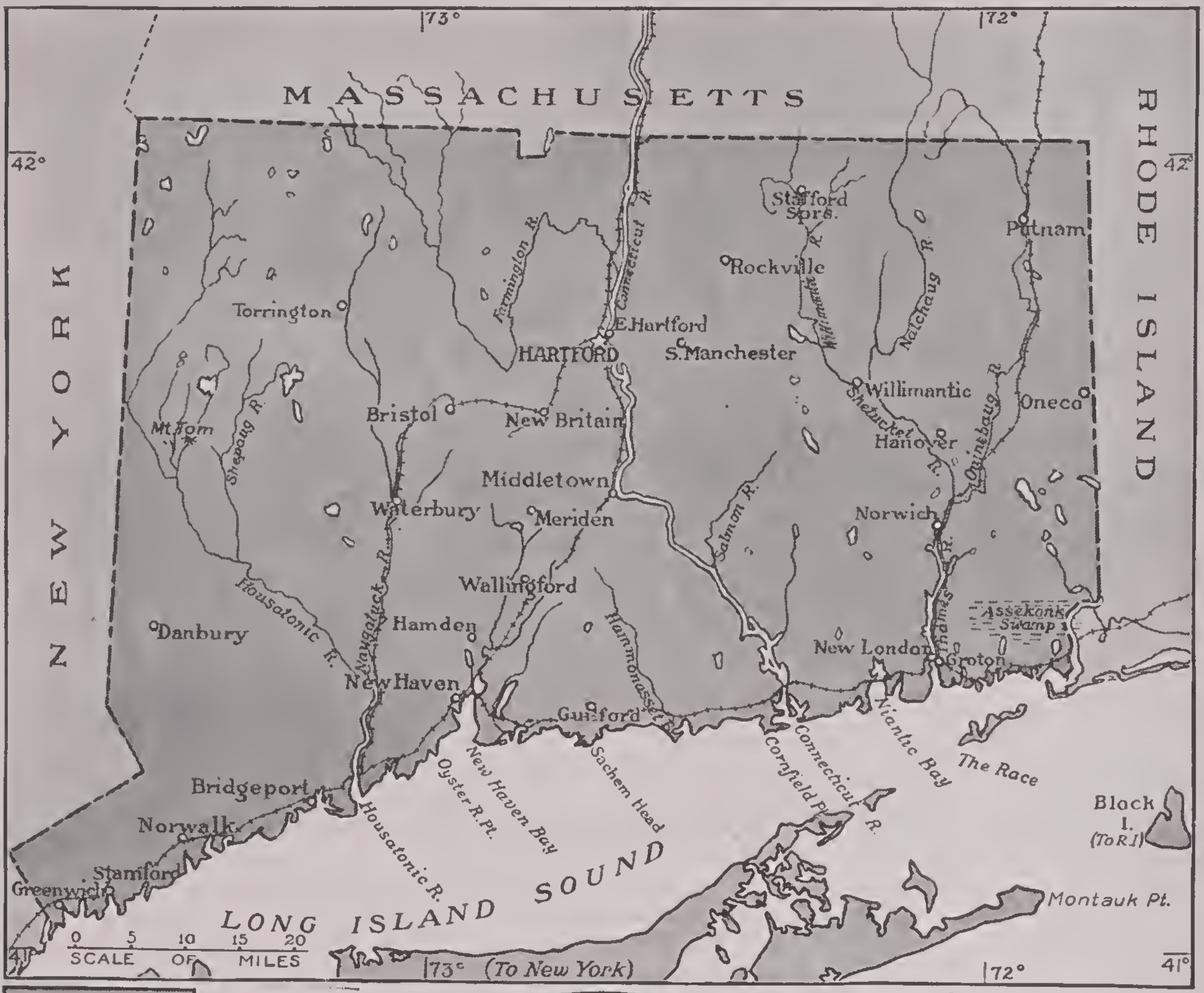
CONNECTICUT. At an early day someone started the humorous story that Connecticut Yankee traders were so shrewd that they sold nutmegs manufactured of wood for the genuine article and wooden shoe pegs for oats. On account of these stories Connecticut is still sometimes called "The Nutmeg State." Yet because of the sturdy solid characteristics of its Puritan-descended population, Connecticut has also been named "The Land of Steady Habits." The real name of the state comes from the Connecticut River; it is of Indian origin and means "long river." The state flower is the mountain laurel, which grows in the hills in the northwestern part of the state, as well as in the middle and eastern sections. Connecticut is the southernmost of the New England states, and is the third smallest state in the Union. It is about one-half as large as Massachusetts and about one-eleventh the size of Illinois. The whole of its population is half a million less than the population of Philadelphia.

Connecticut is noted chiefly as a manufacturing state and as the home of many insurance companies. Its prominence in manufacturing is due to its favorable location geographically which gives ease of transportation by land or water; to the excellent water-power derived from the numerous falls in its rivers; and most of all to the inventive genius and enterprising character of its people.

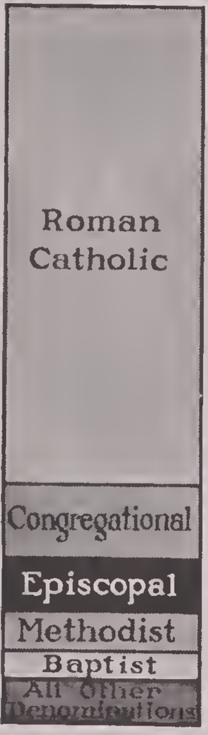
Connecticut ranks first among the states in the manufacture of brass and bronze products: It makes three-fourths of the clocks and watches made in the United States, two-thirds of the plated ware, 65 per cent of all the needles and pins, and a large proportion of all the firearms and ammunition. It ranks second among the states in the production of cutlery and rubber boots. Other important manufactures include paper, millinery, plated ware, thread, musical instruments, typewriters, sewing machines, carriages, bicycles, motor vehicles, cotton, woolen, and silk fabrics. One large shipyard and two smaller ones do a considerable amount of ship-building. One of the largest thread-manufacturing companies in the country is at Willimantic, and at South Manchester is one of the largest silk mills.

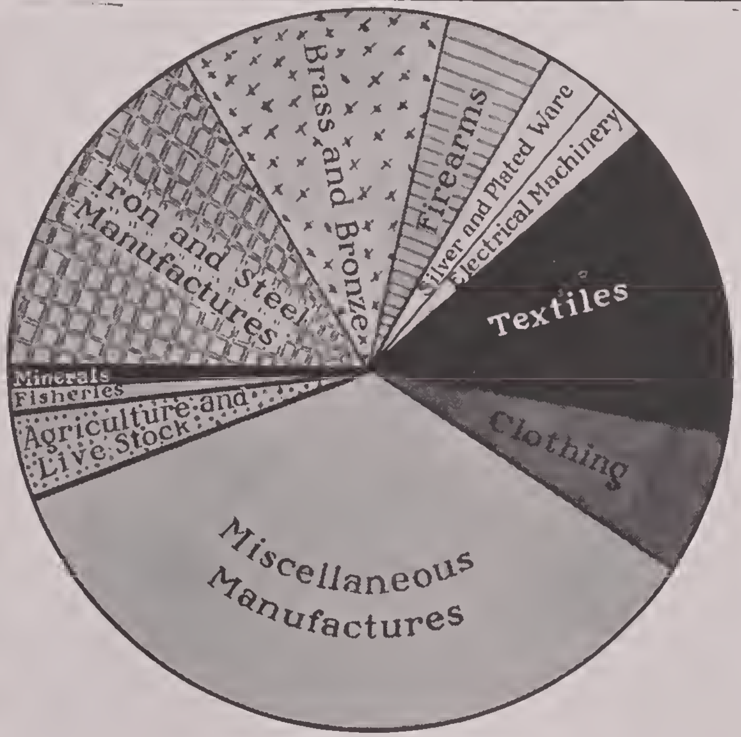
Some of these industries date to colonial times. The manufacture of tinware began in 1770; and the traveling tin peddlers, with their closed red carts, who as late as 1870 went about the country disposing of their wares to housewives for cash or trade, were often Connecticut Yankees. Clocks and watches were

SOME FACTS ABOUT CONNECTICUT AND ITS WEALTH



Although Connecticut still produces a considerable volume of farm products, its manufactures so overshadow these in value that the state might almost be called one great factory. It is an important producing center for textiles, firearms, watches, and silverware; in brass and bronze products it leads the Union. The relative value of its products is shown by the divisions of the circular diagram. The southwestern corner of the state is not far from New York city, and many New York business and professional men make their homes in the smaller Connecticut towns. A chain of well-known summer resorts are dotted along the Connecticut coast, and the whole of Long Island Sound is a busy lane for merchant ships, naval vessels, and private yachts. Altogether, few regions in America have more varied interests packed within so small a space. The divided bar shows the relative number of people in Connecticut belonging to the various religious denominations shown.





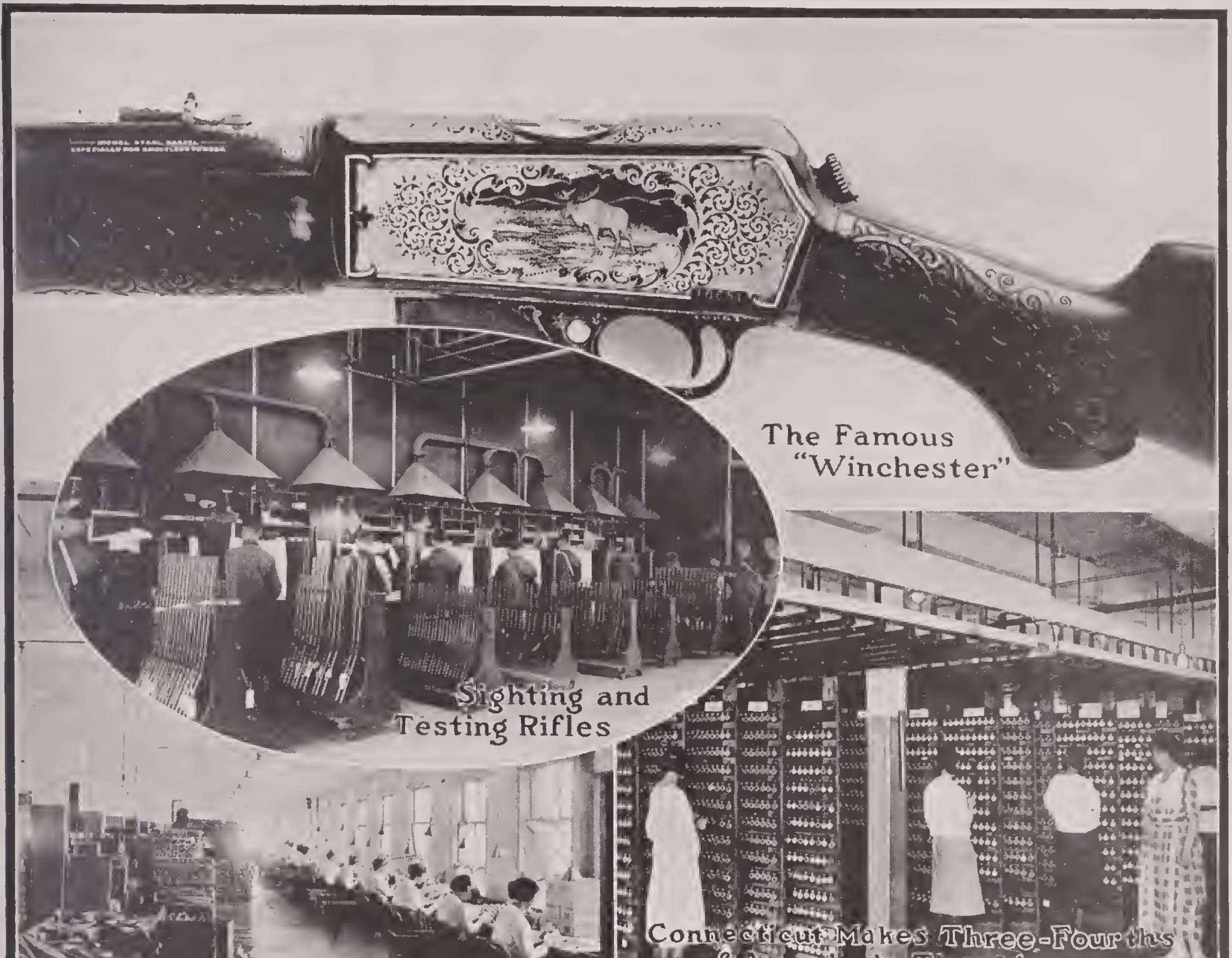
made about 1773, and 20 years later their manufacture was one of the thriving industries. In 1732 the manufacture of men's hats had assumed such proportions that the hat-makers of London complained that imports from Connecticut were ruining their business. Danbury has long been the chief city in the United States for making felt hats. The most important manufacturing city in the state is Bridgeport, followed closely by New Haven, Waterbury, and Hartford. Meriden is a famous center for plated and solid silverware.

What the Rich Valleys Grow

Agriculture is still second in importance among Connecticut's industries. Of the crops raised, hay and other fodder are the most valuable and have the largest acreage. The best lands in the state for agricultural purposes are the rich soils in the valley of the Connecticut River and the smaller valleys of the highlands. The tobacco crop ranks next after the fodder crops, and the mild-flavored "domestic" leaf provides the famous "Connecticut wrappers" so much used in making cigars. Vegetable growing is especially important in places within easy reach of New York City markets. Dairy products are also important, and there are large apple, peach, and pear orchards. Connecticut ranks third among the New England states in fisheries, oysters being the most valuable product. The Connecticut River yields a fair amount of shad.

We do not think of Connecticut as a mining state, but valuable deposits of ore are found in many localities. The Old Granby copper mines were discovered in 1705 and mined for a time, but they proved

A GLIMPSE INTO CONNECTICUT'S BUSY INDUSTRIES


The Famous "Winchester"
Sighting and Testing Rifles
Connecticut Makes Three-Fourths of America's Timepieces
Assembling Clocks and Watches
Connecticut "Wrappers" in the Field
Knitting and Weaving are Important Industries

When the war-clouds threaten, one of Uncle Sam's first "hurry-up" calls goes to the great firearms factories of Connecticut. In response will come a flood of pistols, rifles, and ammunition, together with shells and parts for giant cannon. Meanwhile the textile factories hum, producing uniforms, blankets, and equipment, and the watch factories turn out not only timepieces but many other delicate instruments of warfare. In peacetime, these industries are busy turning out goods famous the world over for their quality. At the top you see one of the rifles made in Connecticut. In the oval, workmen are adjusting the sights of new weapons. Below we see rooms in a watch factory. The girls to the right are checking thousands of watches to see that they keep correct time. Among Connecticut's farm products is a grade of tobacco which finds widespread favor as a wrapper for cigars.

A SPLENDID NATURAL PARK NEAR NEW HAVEN

The huge rocky mound shown above is known as East Rock, to distinguish it from a similar rocky hill to the west of New Haven, and it stands practically at the city limits. The enterprising citizens of New Haven have converted its flat top into a handsome park. On the summit stands a monument, plainly visible in the picture, which was erected in memory of the soldiers and sailors from Connecticut who died in the Civil War.

unprofitable and were finally abandoned; as souvenirs we have the Granby copper cents, the first copper coins minted in America. The abandoned mine itself was used as a prison during Revolutionary War times, and subsequently until 1827, when the state prison was built at Wethersfield. There are deposits of iron ore in the western part of the state, where the Salisbury mines have been worked almost continuously since 1730. The manufacture of hand-made wrought iron nails was for a long time the principal home industry for the colonists in their leisure hours. During the Revolutionary War iron from these mines was converted into cannon balls, camp kettles, and other articles for the American forces. When compared with the production or iron ore in the great ore-producing states, the output is small, but the ore is rich and yields the best iron of its class in this country. Marble, flagstone, feldspar, and limestones suitable for the manufacture of lime and cement are found in considerable quantities. Connecticut ranks third among the states in the production of feldspar.

Much valuable forest land remains, in spite of the large tracts that have been cleared. The timber includes hickory, oak, butternut, beech, birch, maple, ash, and elm. The chestnut blight, caused by a parasitic fungus on the bark, has now killed practically all the chestnut trees in the state.

Connecticut is almost rectangular in shape, and lies between Massachusetts on the north and Rhode Island and New York on the east and west, respectively. Long Island, which lies across the narrow sound from Connecticut the whole length of the state, is politically a part of New York state. Ranges of hills cross Connecticut from north to south, dividing it into eastern and western uplands, central lowlands, and the southern coast section. The valley of the Connecticut is famed for its beauty and fertility. It was here that the first settlers made their home. In the eastern part of the state is the valley of the Thames, formerly Pequot Valley, a region of rolling land with rounded fertile hills. In the western section is the Housatonic-Naugatuck river system; here the hills are rugged and steep and broken by bold cliffs of trap-rock. Bear Mountain, in the northwest corner (2,335 feet), is the highest elevation. The highlands are given over mostly to dairy farming, and the lowlands to market farming. On the irregular southern coasts of Long Island Sound are several good harbors, the principal one being at New London. New Haven, farther to the east, is the largest city.

Hartford, the state capital, is at the head of navigation and commerce on the Connecticut River, 50 miles from its mouth. In recent years extensive improvements have been made in the river by the United States Government. Hartford and New Haven were joint capitals for years, but in 1873 the former became the sole capital.

It is a boast of Connecticut that her excellent school system was planted with the first corn of the earliest settlers. A large part of the school fund is the proceeds from the sale of the Western Reserve lands situated in Ohio. The state has a very low percentage of illiteracy. There is no state university, but there are a number of nationally known schools for higher education, including Yale University at New Haven, a state agricultural college at Stoors, Wesleyan University at Middletown, Trinity College at Hartford, and Women's College at New London.

CONNECTICUT'S FAMOUS "CHARTER OAK"

This huge tree, which stood in Hartford until it was blown down in 1856, was supposed to have played an interesting part in Connecticut's early history. When the British governor Andros came to revoke the charter of the state in 1687, the document was taken from the official files, and is reported to have been safely hidden in a hollow in this tree.

The story of Connecticut is not so romantic as that of some of the other states. The early settlers were clear-thinking men—more broad-minded than their Puritanical neighbors on the north, not so picturesque as the early settlers of New York state—who were filled with determination to build strongly and well a new state on a new soil.

The Dutch claimed the country on the basis of the voyages of Hudson and of Bloch in 1609, and indeed a Dutch trading post was established at Hartford in 1633; but the Dutch attempts to maintain their foothold were ineffectual. The first permanent English settlements were made in 1636, when the Rev. Thomas Hooker and the Rev. Samuel Stone, accompanied by about a hundred men, women, and children, made their way from Massachusetts and reestablished the almost abandoned towns of the earlier Dutch colonists. Gradually others migrated to the Connecticut valley. The New Haven colony was founded with strict laws based on the Old Testament.

THE SCENE OF THE HISTORIC FIGHT WITH THE PEQUOT INDIANS

In 1636 the Pequots brought down upon themselves the wrath of the colonists by murdering an English trader. On May 26, 1637, a small force under Capt. John Mason, with some Indian allies, surprised the main fort of the tribe and killed so many that the Pequots disappeared as an independent nation. This monument marks the spot where the fight took place.

A BIT OF CONNECTICUT'S MOST FAMOUS UNIVERSITY

These halls are just part of one historic row at Yale. The lawn is practically enclosed by buildings forming a quadrangle twice as long as the part shown above, and this group is only one of many that are scattered throughout New Haven. By going through the "Phelps Gateway" in the tower you would come out upon the historic New Haven "Green," the old public ground of the city.

The settlers believed in fair dealing, and followed a straight road. When possible they bought the lands from the Indians at prices they believed fair and just. If those they dealt with wanted peace, well and good; if they preferred to fight, they were more than accommodated. The only serious trouble they encountered was in 1637, with the Pequot tribes, and in one battle they practically exterminated that tribe.

In 1639 the colonists, finding they were outside the chartered jurisdiction of Massachusetts, formed a constitution which stands unique as the first written constitution in the world, in the modern sense of the word. It provided for much less rigid church control than prevailed in the Massachusetts Bay and the Plymouth colonies. The constitution was also very democratic, for the people were recognized as the sovereign power, and the authority and even the existence of the ruler of Great Britain were ignored. In 1662 John Winthrop the younger, then governor, succeeded in obtaining from Charles II a royal charter which established Connecticut as an independent colony under its own constitution. It defined the boundaries as Narragansett Bay on the east, Massachusetts on the north, Long Island Sound on the south, and the South Sea (Pacific Ocean) on the west. These boundaries included New Haven, which was absorbed against the will of that colony.

How Connecticut Defended Her Charter Rights

For 50 years Connecticut was in constant disputes to defend the rights granted in its charter. When Governor Edmund Andros was appointed governor of the New England States, he was instructed to abrogate the existing charters for others more favorable to the crown. He came to Hartford to force Connecticut to surrender its charter or to compel the inhabitants openly to resist. He failed in both attempts. When the news came of the revolution of 1688 in England, Governor Andros was promptly clapped into custody, Governor Treat returned to the executive chair, and the charter was again in full force. Tradition has filled this otherwise unaccountable gap with the story that the charter was hidden in a hollow oak tree, the famous "Charter Oak." When the American colonists declared their independence, in 1776, the charter became the state constitution and it continued in force until 1818, when the present constitution was adopted.

Old Town System Still in Force

The town system of government has continued in effect since the earliest days of colonization. The towns which were in existence in 1818 have two representatives each, no matter how small they may since have become, and the towns incorporated later have one or more representatives as the population is above or below 5,000. The towns have retained marked individuality, and play an exceptional part in the state government.

In the northern boundary of Connecticut may be seen a little oblong indentation, where territory belonging to Massachusetts breaks the straight line. This irregularity is a monument to the error of two surveyors who lived nearly 400 years ago. In 1642, when Connecticut was just starting on her career as a colony, there was some debate as to whether Springfield was in Massachusetts or in Connecticut. Massachusetts sent out two men, Woodward and Saffery, to run the southern boundary, which at that time was "in the air." They began operations by finding the point of boundary in the extreme east, and then took a boat around Cape Cod and up the Connecticut River. They found a place which they asserted to be the same point in latitude as the first, but which was in reality eight miles too far south. Connecticut protested the line and a long dispute followed. Connecticut finally recovered all but this little oblong, but Massachusetts did not finally abandon the old line until 1826.

Under the charter of 1662, it will be remembered, Connecticut was to extend westward to the Pacific Ocean—which at that time was not supposed to be very far distant. This charter gave Connecticut a claim to a large part of the present state of Pennsylvania, as well as to a vast strip beyond; and for a time Connecticut actually ruled what is called the Wyoming Valley of Pennsylvania, where a famous Indian massacre occurred (July 3, 1778). After the Revolutionary War, however, Connecticut agreed to give up all land west of her present boundary, on condition that she be allowed to reserve a tract west of Pennsylvania in what is now northeastern Ohio. The title to this tract containing about 3½ million acres was accordingly given to Connecticut and it became known as the "Western Reserve." About 500,000 acres of this land were sold for the benefit of persons whose homes had been destroyed by the British, and the proceeds from the remainder went to the school fund, remaining intact to the present day.

Connecticut and the Revolutionary War

Buttressed on all sides by other colonies, Connecticut suffered very little in comparison with the other colonies in the early colonial wars and in the Revolution. Troops were freely furnished to the continental cause, however, and Connecticut played an active part. Governor John Trumbull, who was governor of the colony at the outbreak of the Revolution, was the only governor in the colonies who was not asked to resign, and he became a close friend and adviser of Washington. The little commonwealth as a commercial state did not welcome the War of 1812, but it gave men and supplies liberally when war was declared. William A. Buckingham, governor at the outbreak of the Civil War, made a record for promptness and zeal in that conflict; and in the War of 1914–18, Connecticut lived up to her record by the extent of her manufacture of war necessities, especially firearms and munitions.

CONSERVATION. Like a spendthrift who comes into possession of a large fortune and squanders his money recklessly, so the people of America, exulting in the seemingly boundless resources of their rich new country, acquired wasteful habits as regards this natural wealth. They took what they wanted and destroyed what stood in their way, regardless of the needs of future generations. Lands were wasted and soil depleted through wasteful methods; valuable forests were destroyed through reckless lumbering and accidental or intentional fires; bird and animal life was recklessly destroyed; minerals were mined and used without a thought for the future.

It was to check this waste that the conservation movement arose in the last decade of the 19th century. Its aim is to protect the great natural resources—forests, waters, soil, minerals, birds, fish, fur-bearing animals—in order to secure their fullest permanent usefulness. Conservation means a more equal share in nature's gifts for the people of today and the preservation of these gifts for the generations to come.

If the Waste of Things Goes On

Experts estimate that if consumption and waste continue at the present rate, the forests of the United States will be exhausted in from 30 to 40 years, its supply of coal in 150 years, its copper and high-grade iron ores in a generation or two, and its petroleum in 50 years. How can these necessary materials be conserved? Some resources, such as timber, may be renewed by new growth, but coal, petroleum, natural gas, iron, copper, and lead, once gone are gone forever. Take coal, for instance. Millions of years and bygone geological conditions were needed to produce the existing deposits, and when once gone they cannot be replanted. They must be conserved by careful mining so as to avoid waste, by using it so as to get the greatest amount of power out of every ton, and by using substitute sources of power where possible. Millions of tons of coal could be saved by more efficient machinery and by more careful stoking. As one authority has said: "Every fifth shovelful of coal that the average fireman throws into his furnace serves no more useful purpose than to decorate the atmosphere with a long black stream of precious soot. At best, one-fifth of all our coal is wasted."

The rapid exhaustion of the petroleum supply is also causing much anxiety in this age of the gas engine. With the enormous increase in motor vehicles, with the increasing tendency to use crude oil for fuel in the navies of the world, as well as in the merchant service, the petroleum reserves are vanishing at an appalling rate. Even with the greatest economy of use, improved methods of refining, and the elimination of waste in production, experts tell us that the supply will be exhausted within a lifetime, and other fuels must be found for the gas engine.

The Waste of Natural Gas

Natural gas was once wasted with a profligacy that is almost incredible, and enough of this cheapest and most perfect of fuels is still wasted daily in the United States to supply with gas every city in the land of more than 100,000 population. Much has been allowed to escape into the air when boring for petroleum, and formerly flaring torches, which blazed unchecked night and day throughout the natural gas regions, speedily exhausted the "pockets" that furnished the supply.

One means of reducing the consumption of coal, petroleum, and gas is by the utilization of water-power, our "white coal." The United States and Canada have enough potential water-power, experts tell us, to drive every machine, propel every train and boat, and light every building in the two countries, if once the streams should be harnessed by hydro-electric plants for the production of electricity.

The timber wealth of the United States is disappearing at a rate which will exhaust the entire supply in less than half a century unless the waste is checked. Every year the nation takes three and one-half times the amount of timber that is grown. In 100 years, it is estimated, the forest wealth of the United States has been reduced one-half. Waste by fire, by careless methods of cutting and working, has accounted for a large proportion of this destruction. Canada has adopted rigid rules to protect her forest wealth, and since 1891 the United States has set aside enormous tracts as permanent reserves (*see* Forests and Forest Protection).

Beginning of the Conservation Movement

The conservation movement in the United States owes its beginning to Gifford Pinchot, head of the Forest Service under President Roosevelt, who called public attention to the fact that the natural resources were threatened by two great evils—unnecessary waste and unregulated and selfish monopoly. At his suggestion, President Roosevelt in 1908 appointed a National Conservation Commission of which Mr. Pinchot was chairman. The investigations carried on by this commission have led to very important legislation. Vast tracts of land have been set aside as national forests and national parks. The national forests contain nearly one-fifth of all the standing timber in the country, and besides providing great quantities of timber for use, protect the headwaters of the important western rivers, and help to support half the sheep on the western ranges. Public lands have also been reserved for water-power sites and irrigation. Steps have also been taken to safeguard the coal and other resources of Alaska. Water-power under national control no longer passes permanently into the possession of corporations, but is leased for a term of years with an annual rental paid to the government. Unfortunately the enlightened policy of the national legislation is not always supplemented by state legislation to the same wise end. (*See* Lands, Public.)

CON'STANTINE THE GREAT, ROMAN EMPEROR, (288?–337). *Hoc signo vince!* ("In this sign conquer!"). Suddenly at noonday, according to the story, these words on a flaming cross flashed into the heavens before the astounded eyes of Constantine's army, as it lay facing that of his enemy, Maxentius, at the Milvian Bridge not far from Rome.

All afternoon Constantine puzzled over this strange vision. To accept the cross of the despised Christians as his standard was to change the policy of the empire, for only a few years before the emperor Diocletian had relentlessly persecuted the followers of the Cross. But Diocletian's work had proved a failure in many ways. His abdication, leaving the empire divided among four rulers—of whom Constantius, the father (now dead) of Constantine, was one—had failed to secure peace. There had soon come to be *six* emperors ruling at once—three in the West, and three in the East. Constantine in 306 had controlled only his father's portion—the northwest quarter, including Britain and Gaul. But by the year 312, at the time that he saw this vision, he had overthrown one of his enemies and was on his way to Rome to dispose of Maxentius, the other claimant to power in the West.

The night following the appearance of the Cross in the sky, Constantine dreamed that an angel appeared to him and again commanded him to emblazon the Cross on his banner. Next morning he obeyed the command. When his army then went into battle it swept the enemy into the Tiber. Maxentius perished, leaving Constantine sole ruler of the West. To commemorate his victory the emperor built the arch of Constantine, which still stands in Rome, and on it he ascribed his success to "divine inspiration."

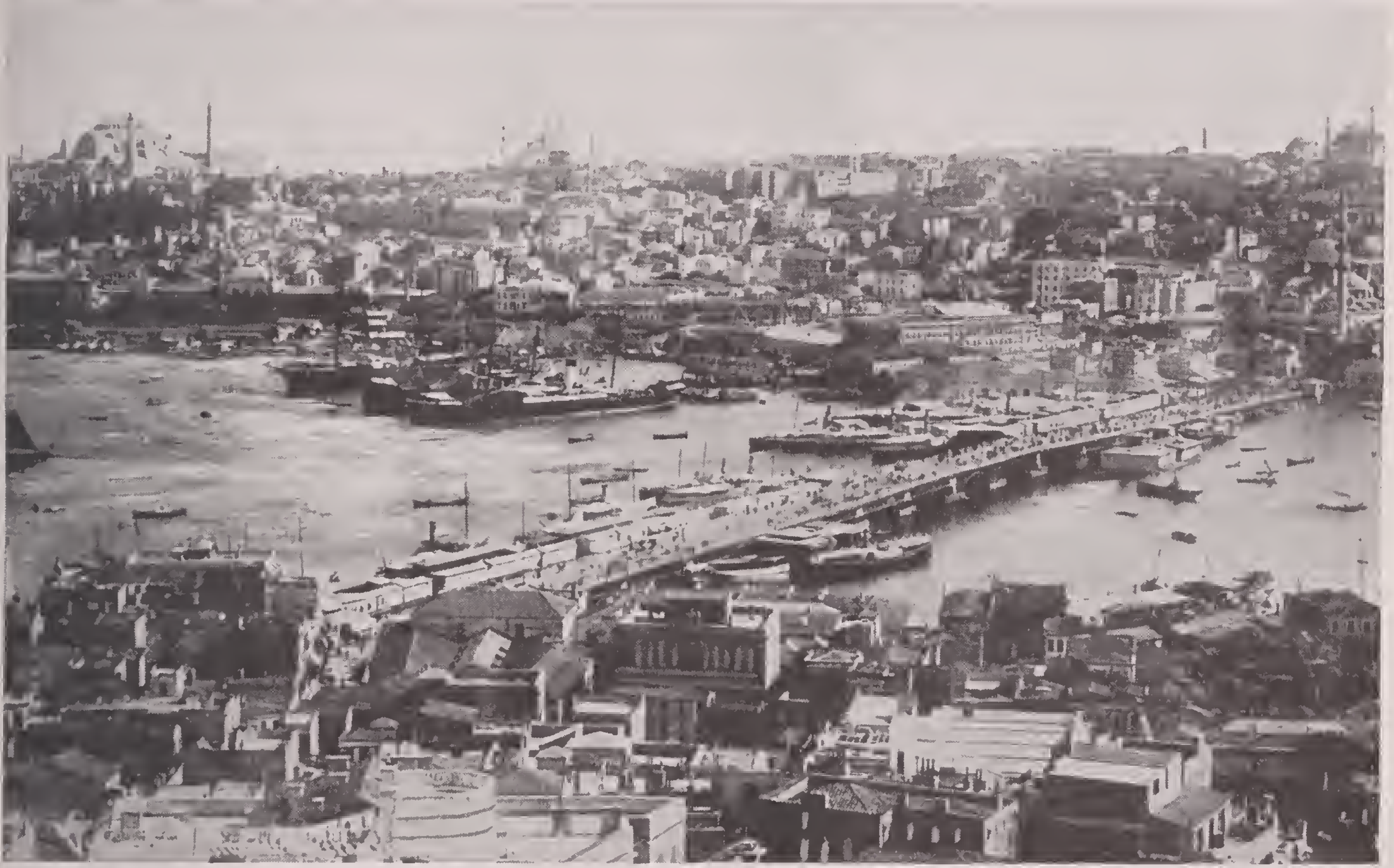
Constantine's mother Helena had long been a Christian, so the emperor may have been favorably inclined towards Christianity before this victory. Perhaps he also saw that in spite of the fewness of its adherents, the future was with the new religion. Next year (313) his famous Edict of Milan gave the Christians the right to practice their religion openly, thus placing them on an equality with the pagans. Constantine also employed a Christian tutor to instruct his children, and Christian bishops sat about his council table. He built Christian churches, and he placed the great imperial post at the service of the bishops to such an extent that the people complained that so many bishops traveling free of charge demoralized the service. His laws concerning the treatment of prisoners and slaves showed the kindly influence of Christian teachings. And before his death he himself professed the Christian faith and received baptism. In 325 he called together at Nicaea the first general church council that it might settle the Arian-Athanasian controversy over the doctrines of the church. The Nicene creed which was then drawn up as the statement of the belief of the church is still accepted by Catholics and Orthodox Protestants alike.

In the year 323 Constantine defeated Licinius, the eastern Roman emperor, and gained control of the whole empire. He then decided to change the capital from Rome to the "city of Constantine" on the shores of the Bosporus. Years later it was erroneously claimed (in the so-called "Donation of Constantine") that he made this change in order that the government of Rome might be given to the bishop of that city—the pope. For seven years after Constantinople was founded Constantine ruled in comparative peace, employing his time and his wealth in building palaces and churches and in entertaining the people at splendid festivals. With him the Roman Empire definitely took on the pomp and character of an oriental despotism.

Constantine's full name was Flavius Valerius Aurelius Constantinus. He was born in upper Moesia (now Serbia) in 274 A.D., and was educated at the court of Galerius, the Eastern emperor—practically as a hostage. The year before his father's death he fled to Gaul, where Constantius then was, carrying off the post horses on the way to evade pursuit. Constantine died in Asia Minor while waging war with the king of Persia.

CONSTANTINO'PLE. On foot, with a lance in his hand, the emperor Constantine in the year 324 A.D. led the solemn procession which traced out the boundaries of his new capital, Constantinople. His assistants observed with astonishment the growing circumference, and at length ventured to observe that he had already exceeded the size of a great city. "I shall still advance," replied Constantine, "till He, the invisible guide who marches before me, thinks proper to stop."

Thus were marked out the boundaries of the city which for more than 1,000 years reigned as queen of the civilized world. The resources of Europe were at her command. The old buildings of Greece and Rome were despoiled of their most perfect sculptures to render her beautiful. Located on the confines of Europe and Asia, every wind wafted the riches of the most distant countries of the world into her secure and capacious harbor, the Golden Horn. Situated on her seven hills on the shores of the narrow Bosporus between the Black Sea and the Sea of Marmora, with the narrow Hellespont (Dardanelles) leading thence to the Aegean, her port can easily be closed to a naval fleet of an enemy in time of war, and opened in peace to the fleets of commerce.



THE MAGNIFICENT CITY ON THE "GOLDEN HORN"

We are looking down upon Constantinople from the heights of Pera, as the European quarter of the city is called. The Golden Horn, a narrow inlet from the Bosporus which forms the harbor, sweeps across the middle of our view. Beyond lies Stamboul, the Turkish quarter. At the extreme left rises the great dome of Santa Sophia, once a Christian church, but turned into a Mohammedan mosque after the capture of Constantinople by the Turks in 1453.

When the Turks broke through its walls and obtained possession of this imperial city, in 1453, they were able to cut off the trade of Europe with the East, and so gave occasion for Columbus, Vasco da Gama, and others to search for new routes to the West. As late as 1807, when Alexander I of Russia asked Napoleon for its possession as the price of his friendship, Napoleon exclaimed, "Never! Constantinople is the empire of the world." Many have coveted this prize but their mutual jealousies have been its defense. And so Constantinople has remained in the hands of helpless Turkey, "the sick man of Europe," because the nations could not agree upon the question to whom it should be given.

Before Constantine's day the site of Constantinople was occupied by the Greek city of Byzantium, founded in 667 B.C. by Greek colonists from Megara. Today the city of Constantinople presents a magnificent appearance from the sea, especially in that section where the rose and white of the former basilica (now mosque) St. Sophia and the golden gleam of many minarets are visible. But on closer inspection the city is disappointing. Its streets are narrow, crooked, and heaped with garbage.

The city is really made up of a number of smaller cities. To the south lies Stamboul, the Mohammedan quarter. Galata on the east is the business section, and Pera to the northwest the foreign quarter. There are few large factories, but rugs, carpets, and embroideries are made by hand in the little shops and in the homes. The chief business, however, is commerce, for through it is still shipped much of the goods passing between the East and West, although the building of railroads has somewhat diminished the importance of the city as a shipping center. Population, about 1,200,000.

CONSTELLATIONS. To the lad of ancient Greece, the sky was a story-book filled with living pictures. Real books were rare, and besides he probably couldn't read. Houses were poorly lighted, and there was nothing to do indoors after dark except go to bed, which he hated as much as the boys of today. So he would go out to lie on his back in the grass and let the stars spin their yarns.

The Greeks believed that the stars had an important influence on their daily lives, and that knowledge of the stars would guide them in planting their crops, in forecasting the weather, in telling their own fortunes, and in many other things. From the maze of lights that dot the night sky, they picked out the brightest groups, the "constellations," and gave them names. In their vivid imagination, these constellations took on the shapes of gods and goddesses, of ancient heroes and heroines, of beasts and birds, all playing parts in a great heavenly drama.

On dark nights, perhaps while they were guarding the sheepfold from the wolves, the Greek father taught his son the names of the constellations and their positions. There was the story of the Great Bear, for instance, who was really the beautiful nymph Callisto. This nymph had aroused the jealousy of Hera, wife of the great god Zeus. To protect Callisto, Zeus changed her into a bear. But Arcas, Callisto's son, while hunting in the forest was about to kill his mother, whom he took for an ordinary bear, when Zeus in pity changed him into a little bear, and placed them both in the heavens. There they are to this day, the Little Bear, the tip of whose tail is the North star, and the Great Bear, whose tail and hindquarters form what we call the Dipper.

And so each one had a story. Hercules (Heracles) is swinging his club, while Ophiuchus holds the Serpent. The Swan and the winged horse Pegasus are flying an eternal race. Andromeda is struggling in her chains, while Perseus, carrying the head of the Medusa he has just slain, rushes to her rescue. Castor and Pollux, the "heavenly twins," and a score of other figures take their part in the great play.

All of these were supposed to have an important effect on human affairs. To this day, when we speak of the "dog days" of summer, we are referring to an ancient belief that the July heat was caused by the rising with the sun of the constellation of the Great Dog, in which lies the bright star Sirius.

The most easily recognized of all the star groups is the Dipper mentioned above. The bowl is made up of four stars at the four corners, while three other stars give the outlines of the bent handle. If you learn to know the Dipper, you can always find the North star, for it is the first bright spot in a line with the two stars which form the side of the Dipper opposite the handle.

There are of course many constellations visible to people who live on the southern half of the earth that cannot be seen in northern latitudes. These were unknown to the Greeks and received their names in later times. Among the most important of these is the Southern Cross, so frequently mentioned in tales of sea voyages south of the Equator.

Ptolemy, the ancient astronomer of Alexandria, listed 48 constellations. In modern times this number has been increased to more than 80. Important constellations besides those already named are Cassiopeia (the Woman in the Chair), Lyra (the Harp), Scorpio (the Scorpion), Corona Borealis (the Northern Crown), Leo (the Lion), and Auriga (the Charioteer).

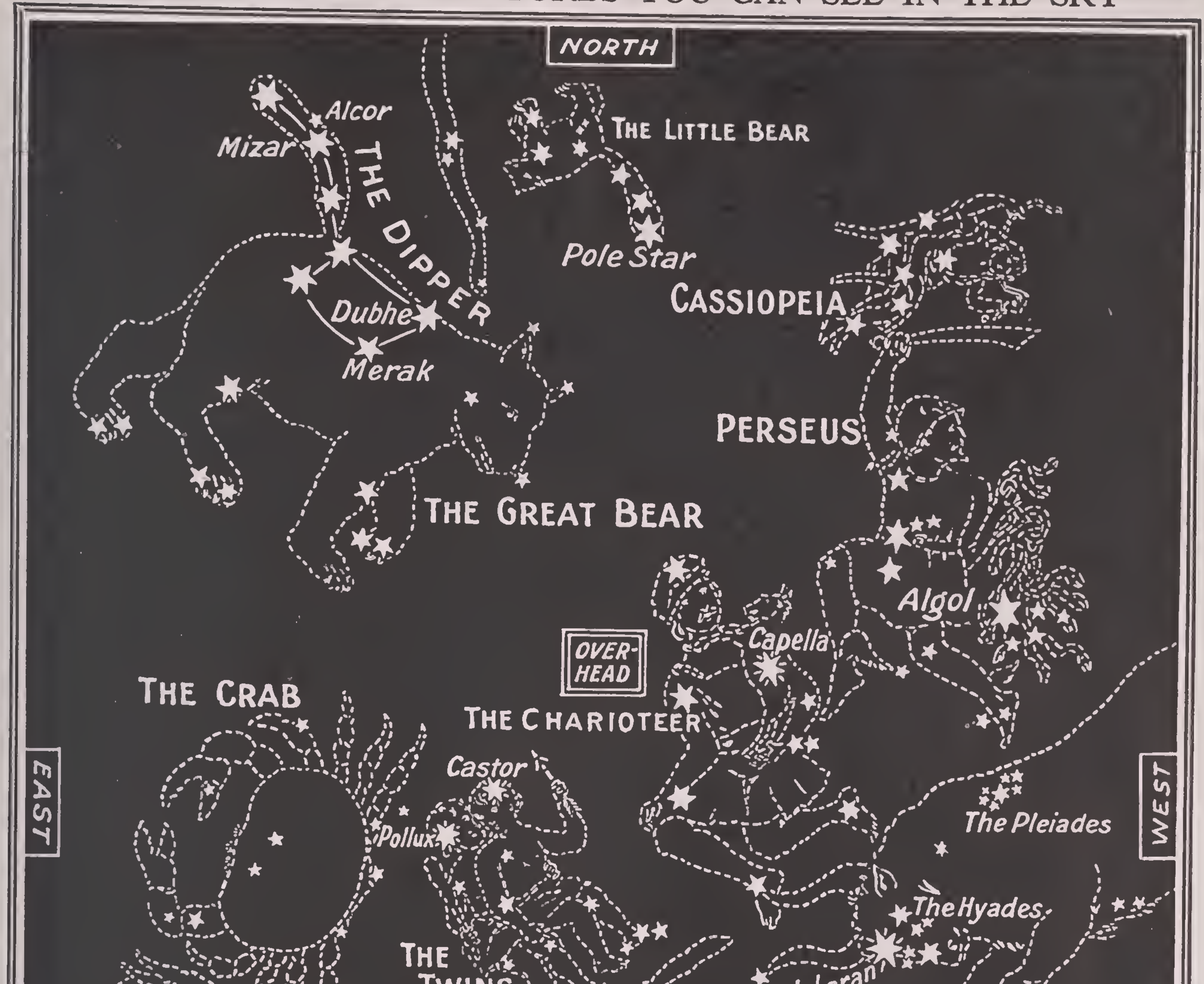
CONSULAR SERVICE. Every great nation appoints agents to reside in the important commercial centers of foreign countries as representatives of its commercial interests. These officers are called consuls, and among their various duties are those of supervising all matters concerning the trade of their country with such centers, and of reporting to their home government on new markets for its products, etc. While their duties pertain chiefly to commerce, they have certain judicial duties as well, and act as protectors and advisers of their fellow-countrymen present in foreign lands. All United States consuls are appointed by the President with the advice and consent of the Senate. (*See* Diplomatic Service.)

COOK, CAPTAIN JAMES (1728–1779). One morning a century and a half ago a tribe of savage Maoris of New Zealand, coming down to the shore to fish, looked upon a strange sight. A huge bird, the like of which they had never beheld on land or sea, seemed flying toward them, its great white wings outspread. It paused in its flight, and an "unfledged young one"—as they described it to later visitors—put out from the side of the mother bird and quickly made for the shore. But as it came nearer, great was their surprise to see that it was a boat filled with men—or perhaps gods, for their pale faces and strange dress made them look very different from the natives of the South Seas. Amazement gave place to terror when a volley of musketry fired from the boat crashed like a thunderbolt over their heads.

Well might the simple natives stand in awe of these daring navigators, the first white men to set foot on that far-off shore. The gallant Captain Cook, greatest of all English maritime discoverers, was guiding them in the unknown ways of the Pacific.

After coasting New Zealand and sailing through the channel, since known as Cooks Strait, which separates its two islands, he steered toward Australia (then called New Holland). Other explorers had touched that coast on the west and north and brought back reports of its barren and forbidding nature. Captain Cook approaching the east coast saw a far different scene—a beautiful country of plains and gently sloping hills covered with green woods. Captain

THE STRANGE CREATURES YOU CAN SEE IN THE SKY



When the old Greeks looked at the heavens, they imagined that the stars traced the outlines of all sorts of curious figures. So they grouped the stars off into constellations and named them after the animals and gods they represented. Modern astronomers continue to use those names for star groups. Here we see a portion of the sky as it looks on a clear winter's night, with the outlines of the constellations filled in. You must imagine you are facing south and looking directly up over your head.

Cook is called "the real discoverer of Australia," for he was first to survey the fertile coasts and see that it was a land fit to become the home of white men.

Born in Yorkshire, October 27, 1728, Cook became a shopkeeper's apprentice in a small seacoast town and early acquired a taste for a sailor's life. He entered the royal navy in 1755, and four years later, as master of the ship *Mercury*, took part in the expeditions against the French in the St. Lawrence River. His skill in map-making won him favor with the Royal Society, which sought his leadership for scientific expeditions.

A BLOW FROM BEHIND KILLED THE BOLD EXPLORER

On Feb. 14, 1779, Captain Cook landed with some of his men in one of the bays of the island of Hawaii to recover a boat stolen by the natives the night before. A fight began, and Captain Cook turned to signal to his ship for reinforcements, when he was stabbed in the back by a Hawaiian warrior.

Cook's first voyage to the Pacific was made in 1768–71. A second voyage of exploration (1772–75) took him to the Antarctic, where he crossed the Antarctic Circle for the first time in history and wiped from the maps the imaginary continent supposed to lie not far south of Australia. He did not go far enough south into the ice fields, however, to discover the real Antarctic continent, which was not reached until long after his day. He also cruised on this voyage in the southern Pacific, discovering several islands and leaving the map of that part of the globe in much the same form as we have it today.

The best years of his life had been spent in braving the hardships and perils of the sea, but Captain Cook at the age of 48 was still eager for adventure, and he set out on a third voyage in 1776. Sailing again into the Pacific, he came upon the Hawaiian Islands—discovered earlier but subsequently forgotton—and named them the Sandwich Islands, in honor of the Earl of Sandwich, first Lord of the Admiralty. Then he went northward along the American coast as far as Bering Strait and a little beyond, but was forced by a wall of ice to turn back, thus ending his dream of finding the "northwest passage" from the Atlantic to the Pacific.

He returned to winter at Hawaii. As always, he had won the friendship of the natives by his wise and kind treatment, but trouble arose when one of the ship's boats was stolen. Cook landed in order to make a peaceable settlement with the islanders, and was treacherously struck down and killed.

Thus died the daring discoverer who had surveyed a greater length of coast line than any other man; who had remade the map of the Pacific; and whose explorations gave to Great Britain the lands now occupied by the two great self-governing commonwealths, Australia and New Zealand.

Captain Cook remains to this day the ideal type of the bold explorer. Caring little for reward, he seemed to start on his voyages prompted by a high love of adventure and a curiosity about distant lands and their peoples. To his task he brought a high degree of intelligence, so that his records were of great scientific value, and he was loved by his men as much for his kindness as for his courage, for he saved many a life by the skilful medical care he gave his crews.

Cooking When Mother is Sick

COOKING. What did you do to help the last time mother was sick in bed for a day or two? The best recipe for making a mother get well is to have a daughter or son who can go into the kitchen and prepare a pretty tray with well cooked food on it and carry it into her without asking her one single question about how to do things or what she would like to eat. And then, when the tray is brought to her to hear this same boy or girl say: "Now don't worry a bit, mother, because I have dinner ready for the rest of the family and you just take a nap."

The best part of this recipe is that any boy or girl who wants to try it and is willing to follow directions exactly as they are given is sure to make a success of it. And then think of the fun it will be when you really learn to cook so well that you can give your own parties and picnics!

The most important rules for cooking the principal sorts of food can be given in one lesson. Of course it won't contain many recipes, but you can get hundreds of them in any cook-book. There are really only a few important recipes in cooking anyway, and all the others are simply changes on these.

THE art of preparing foodstuffs by the use of fire first raised man from the level of the beasts by enabling him to use as food articles which uncooked are uneatable or unwholesome. It remains one of the important arts of civilization—cherished by the ancient Egyptians, Greeks, and Romans; improved by the monks of the Middle Ages; and made a fine art by the French since the days of Louis XIV. Boys today are not ashamed to learn to cook, and to be a successful home-maker should be the ambition of every well-brought-up girl. Home instruction is now supplemented in most progressive schools by classes in Domestic Science, while special cooking schools flourish in many parts of the country. The accompanying article gives some of the first principles of this important art.

Various Soups and How to Make Them

Soups are of only two kinds—those made of the broth from boiled meat, which is called "stock," and the cream or vegetable soups made with milk or water and one or more kinds of vegetable or other flavoring. For the meat soups you can buy a fresh soup bone of either beef, lamb, or mutton; or you can make it of any leftover meat and bones from a roast, or chops, or beefsteak. If you have scraps of two or three kinds of meat, they may all be cooked together and will make a soup that has a fine flavor. The best seasoning to add to the meat is vegetables that have a pretty strong flavor. Onions, celery leaves, stalks, or roots, carrots, turnips, parsley, and parsnips are all good. If you buy a fresh soup bone, get one that has a good deal of meat on it and have the butcher split the bone for you. The soft marrow will make the soup richer and of better flavor. Wash the bone carefully in cold water until there are no specks of any sort on it. Then put it into a deep kettle, add the vegetables for the seasoning and about four cups of *cold* water for a small soup bone or eight for a large one.

Put the kettle on a very low fire so that the water will heat slowly and will only simmer gently during the whole time of cooking. When it is simmering you can barely see tiny bubbles coming from the bottom of the kettle to the top. Let it cook this way for about four hours or until the meat from the soup bone falls apart when you lift it gently with a fork. Strain the soup and add one teaspoonful of salt for each four cups of soup. Then put the soup where it will be as cool as possible so that the fat will come to the top. But don't put the hot soup into the ice box right away, but let it stand outside until it is not at all warm. When the soup is cold the fat will be over the top in a hard cake, and you can take this off and save it for frying. If you have scraps of meat and bones, make the stock just the same way. Chicken soup, duck soup, or rabbit soup can all be made this way by using the fresh meat and bones or by using the leftover bones and scraps.

For vegetable soups, add any kind of raw or cooked vegetables to the soup stock, after the fat has been removed, and cook for about half an hour or until the vegetables are tender. If you have some cold cooked vegetables that you want to use, add them in the same way and cook for about ten minutes so they will be good and hot. The soup looks nicest when the vegetables are all cut about the same size. Be sure if you add raw vegetables that you clean and peel them well first. If you like thick soups add a tablespoonful of rice, oatmeal, barley, or half a cup of spaghetti, for each two cups of the stock.

ARE YOU AN ARTIST WITH FOOD?

Have you ever thought that a good cook is an artist? Your foodstuffs are the materials from which you can create a masterpiece for the table, just as the artist uses his colors to produce a splendid painting.

So you see that you can make many kinds of soup out of the one pot of stock. Keep the stock in a cold place and heat just what you want for each meal. When adding vegetables or thickening keep a cover on the soup and cook it over a low fire, or a great deal of it will boil away while these seasonings are cooking.

If you want some soups in a hurry for unexpected guests, or for mother when she is sick, and you have no stock made, the cream soups are very good; also the cream sauce that is the main part of them is one of the most useful things that you can learn to make. For it is this same sauce, made thicker or thinner or with different seasonings, that is used for all creamed vegetables, cheese sauce, croquettes, creamed fish or meats, and many pudding sauces.

COMMENCING A KITCHEN MASTERPIECE

The skilful cook not only turns out tempting dishes, but makes the foodstuffs go as far as possible, by planning uses for the "left-overs."

Melt one tablespoonful of butter or oleomargarine; take from the fire, add one tablespoonful of flour, and stir until it makes a smooth paste and you can see none of the flour. Then add two cups of cold milk and return to the fire. Stir it all the time, with the fire kept low, until it is thick and smooth. Then add one-half teaspoonful of salt and one-fourth teaspoonful of pepper, and a cup of any cooked vegetable you like. The vegetable must first be chopped or cut fine or pressed through a sieve, and should be drained of all water. Stir the soup until it is well mixed, let come to a boil and serve.

The only cream soup that is made differently is cream of tomato. For this, heat the tomatoes, after they have been put through a sieve; when the tomato pulp is hot add one pinch of soda (as much as you can pinch between your thumb and finger) and stir; then add the tomato to the hot cream sauce. This soup should be served as soon as it is made, as it is apt to curdle if it stands. So if you are not quite sure when everyone will be ready, keep the tomato hot and the cream sauce hot, and add the soda and mix the two at the last minute.

You see these are only the plainest of recipes, so that you can have the fun of making new combinations from them. It is like having a brand new paint box with all the colors ready for you to try and mix and make new and prettier ones. A combination of several vegetables cooked together and then put through a sieve is also good. But be sure in these mixtures that you have more of one kind of vegetable than of any of the others, so that the soup will taste stronger of it than of any of the rest.

Onion and celery always combine well with any other vegetable and help to bring out its flavor, just as a little line of black around a picture makes all the other colors stand out more strongly.

The cooking of meats, simple as it is, is often badly done. So if you learn to cook meats nicely, your mother, and all the family will be proud of you and you will be proud of yourself.

There are four ways of cooking meats—broil, boil, fry, and roast. The fancy ways are only combinations of two or more of these ways. All four methods have the same object, that is, to close up the little pores that are in the meat, as they are in your skin, and keep the flavor in the meat instead of drawing it out, as you do in making stock. So the first thing is to start cooking your meat in a very hot oven (in roasting), hot grease (in frying), boiling water (in boiling), or close to the fire (in broiling). In boiling or roasting let the meat cook at this high temperature for about 10 or 15 minutes, then lower the heat so that it will cook slowly for the rest of the time. In broiling or frying let it cook for only two or three minutes, then turn over and cook on the other side. When both sides are seared in this way, lower the heat and let the meat cook slowly until it is done. Even a tough old chicken will get tender if you boil it hard for only the first ten minutes, and then cover it and let it simmer gently over a low fire, as you did in making the soup. For the many ways of cooking meat you can look in your mother's cook-book. But if you remember to do the cooking with a hot fire for the first 15 minutes, and then lower the heat for the rest of the time, you are sure to have tender and juicy meats.

WHERE SKILL BECOMES IMPORTANT

Handling the food on the fire is the most difficult part of the cooking art. It is here that the dish is made or marred.

Different Ways of Cooking Eggs

Eggs should always be cooked with a low fire, as a hot one will make them harden. Then they don't taste good and are much harder to digest. Even hard-boiled eggs are more tender and digestible if they are put into water that is simmering, covered closely, and kept that way for 40 minutes. Eggs cooked any other way should be cooked only a few minutes before they are to be served, as they do not stay hot or taste good long after cooking. For fried or scrambled eggs, or for omelets, do not have the grease in the pan smoking hot, as this will make them tough. For poached eggs have the water simmering, and after the eggs are put in cover with a tight cover. For creamed eggs make the cream sauce as you made it for cream soup, but use a tablespoonful of flour, or two if you like a very thick sauce, for each cup of milk. When the sauce is thick add the hard-boiled eggs cut in pieces. A tablespoonful of grated or finely cut cheese added to each cup of sauce makes this especially good.

If vegetables are wilted soak them in cold water until they are crisp. Scrub them clean with a small brush, cut out all bruised or dark places, and start cooking in enough boiling water to barely cover them. When they are boiling turn the fire low and put a tight cover on the pan. If you are careful to have the fire low enough and the cover tight you will need little water and won't have any to drain off when the vegetables are done. The water that is so often thrown away from cooking vegetables has as much of the flavor and good of the vegetables in it as the soup stock has of the meat. So don't use too much water or too much fire. Be sure to start with boiling water, as this closes the pores in the vegetables just as a hot fire does when you start to cook meat. When the vegetables are done make a cream sauce for them or serve with pepper and salt and butter. If you have any water left in the pan when the vegetables are done, use part of it with the milk to make cream sauce.

Cakes, Muffins, and Pancakes

Recipes for all of these you will find in any large cook-book. They are all made in the same way. The main thing is to make them light, and this is done in three ways—by means of the eggs, the baking powder or soda, and the air that you beat into them. Mixing and beating a batter makes tiny air holes through it. The more air holes the lighter the cake, so you see why butter and sugar must be well mixed (creamed) and the eggs beaten light. The third way of making batters light is by using baking powder and soda. Muffins or pancakes have little or no shortening (butter or fat) compared with cake, and are easier to make; so start with them first.

In picking a recipe to try for your first cake, take one that does not use much butter, sugar, or eggs, as it is simpler to make and does not waste so much if you should fail the first time. A one-egg cup cake is best. Read the recipe over carefully and get all the materials for it on the table before you start the cake. Have the oven at the right heat. If the recipe says "moderate oven," a piece of yellow wrapping paper put into the oven should turn golden brown in five minutes. For "hot oven" the time is four minutes, and for "slow oven" seven minutes. Muffins, biscuits, and layer cakes need a hot oven, loaf and cup cakes a moderate oven, and fruit, sponge, or angel cake a slow oven.

THE TEST OF THE TRUE COOK

Baking is the trickiest kind of cooking, and many housewives never learn the secrets of the oven. The girl who can bake can consider herself mistress of her art.

After you have learned to cook one thing at a time, the next thing is to learn how to have a whole meal ready at once. Always start first on the things that will take the longest to cook or prepare, such as meat needing long cooking, or vegetables that have to be cleaned slowly.

Here is a bill of fare for your first whole meal:

Meat balls in gravy
Creamed cabbage
Baked potatoes

Scrub or wash carefully four large or eight small potatoes. Put into a "moderate oven" and bake one hour for large or 45 minutes for small potatoes. They are done when a fork goes through the middle of them easily.

Chop or cut one onion fine, add one pound of ground round or other steak, one teaspoonful salt, one-fourth teaspoonful pepper, one egg beaten, and half a cup of cracker or bread crumbs. Mix with your hands and make into flat cakes. Heat three tablespoonfuls of fat in a frying pan and when smoking hot put in the meat balls. Cook on one side until light brown, turn on the other side, and brown. Remove meat from the pan and stir into the fat three tablespoonfuls of flour. Make into a smooth paste as in cream sauce, and add three cups of cold water. Stir over the fire until thick and smooth. Add the meat balls, cover, and let cook over a slow fire until dinner is ready.

Take all wilted or brown leaves off the cabbage. Cut into four pieces and cut out the hard core in the middle. Cut the cabbage into small pieces, cover with boiling water, add one teaspoon of salt and let cook without a cover for one-half hour, a little longer for old cabbage. When tender pour off any extra water, and use one-half cup of the water and one-half cup of milk with two tablespoonfuls of flour and two of butter, to make the cream sauce. After adding the cream sauce to the cabbage put it on the back of the stove or on top of the oven, where it will keep hot. Now set the table, and put the plates and serving dishes where they will get warm. Put on bread, butter, and water. Then dish up the hot things, and dinner is ready. If you must have a dessert, use some canned or fresh fruit, as this will be easier for your first dinner.

This is a very short "cook-book," but it will help you to use the big cook-book, and save you from making many mistakes. But try the simple recipes first, and the fancy ones later. Have only a few things to eat at the first meals you cook, but have plenty of them and cooked to the queen's taste.

Cooper, James Fenimore (1789–1851). "The American Scott," as he has been called, was the first American novelist of importance, and although others have followed who were greater artists and greater masters of character drawing, no one has taken Cooper's place as the favorite of the boy who is eager for vivid tales of pioneer life among the Indians, of the sea, of action and adventure.

Cooper was born at Burlington, N.J., but when he was a year old his parents removed to Otsego Lake, N. Y., on the shores of which they founded the village of Cooperstown. In this region, then a wilderness, young Cooper spent his early years, and here in daily contact with Indians he gained impressions and experiences which furnished material for his tales of pioneer life. After studying at Yale College, he entered the navy, and to his five years' experience in this service we owe his splendid tales of the sea.

Strangely enough, however, he did not at first realize all the possibilities of his own experiences. His first novel, 'Precaution', written at the age of 30, after he had resigned from the navy and become a country gentleman in Cooperstown, was a story of English society, of which he knew nothing. The failure of this novel taught him the lesson that no one can become a good writer by imitating others, and he turned to the scenes and adventures he knew.

The following year he wrote 'The Spy', a tale of the Revolution, which brought him instant popularity. This was followed by the various volumes of his 'Leatherstocking Tales', so named from Leatherstocking, the favorite nickname of Natty Bumppo, the chief figure in all of these stories. This scout is the finest character Cooper has drawn. He is strong, acute, and daring; he is simple and noble; he is cool in the face of danger, and utterly at home with Nature in all her moods. The Indian characters have been criticized as not being true to life, but Chingachgook and Uncas, though idealized, are so real in their way that they are never forgotten.

Cooper's chief works are: 'The Spy' (1821); 'The Pioneers' (1823); 'The Pilot' (1823); 'The Last of the Mohicans' (1826); 'The Prairie' (1827); 'The Red Rover' (1828); 'The Pathfinder' (1840); 'The Deerslayer' (1841); 'Wing-and-Wing' (1842); 'Afloat and Ashore' (1844).

COÖPERATIVE SOCIETIES. In 1844, 28 poor weavers in Lancashire, England, decided to pool their small resources and buy their provisions together. They had less than $140 with which to start their enterprise, but from this small beginning has grown the great consumers' coöperative societies of today. Their purpose is to save for the consumer the profits of all "middlemen."

These organizations in Great Britain not only sell goods direct to the consumer, but also conduct large wholesale enterprises. They own steamship lines, tea lands in Ceylon, olive groves in northern Africa, currant establishments in Greece, and raisin vineyards in Spain. They manufacture soap, shoes, textiles, jams and preserves, flour and bread, and many other things. Fully one-fourth of the entire population of Great Britain are members of these societies, whose purpose is not to make profits, but solely to reduce the cost of living to their members.

Spread of the Idea around the World

The coöperative idea soon spread from Great Britain to the other countries of Europe, and it has even reached far-off Japan. In France more than 400 local coöperative associations have united in a wholesale coöperative society doing an enormous business. The wholesale societies of Denmark, Norway, Sweden, and Finland have joined forces in a great Scandinavian Alliance. Switzerland and Austria also have well organized coöperative movements. In no country, probably, has coöperation developed to so great an extent as in Russia before the World War, where coöperatives played a large part in the political as well as the economic life of the nation. In spite of the disorganization caused by Bolshevist rule, Russia had 80,000 coöperative societies in 1919, with a membership of 20,000,000 householders. The coöperative movement is strong also among the peasants of Bulgaria, Serbia, and other Balkan countries.

In the United States the coöperative store took root slowly. It was easier to earn money here than in the older countries, and people were not so much interested in small economies until prices soared to such heights in the World War period. One of the most important of the early organizations for coöperative distribution was the Patrons of Husbandry, popularly called the "Grangers," founded in 1867, which encouraged the establishing of coöperative stores by the members of its 13,000 local lodges or "granges." Soon after 1880, however, this coöperative movement collapsed, the chief permanent result being the continuance of its western wholesale center as a great private "mail-order" house. Other organizations composed of workingmen have tried to do for their members what the Grangers attempted for the farmers. The coöperative stores of the United Mine Workers of America and those of the railway brotherhoods are perhaps the most important of the existing organizations. In many colleges and universities, also, coöperative bookstores are formed to supply textbooks and supplies to students at cost.

The plan of organization for these coöperative stores varies in details but not in principle. Usually the operating capital is obtained by selling shares of stock to members, who in return receive either interest on their money, a special discount on their purchases, or some other advantage. Goods are bought for cash and sold at a price barely sufficient to cover operating expenses, with a slight margin of gain for safety. Outsiders usually may buy at the stores, but only members share in the gains, and this ordinarily in proportion to the amount of their own purchases. An executive committee of the members in most cases appoints the storekeeper and oversees the management of the business.

This so-called "consumers' coöperation" is only one form of the coöperative movement, though it is perhaps the most important one. Producers' coöperation is much older. In England it dates from the time of Robert Owen at the end of the 18th century. About the same time Fourier in France was advocating similar doctrines. But both of these men went farther than mere coöperation and advocated socialistic communities such as Owen later established at New Harmony, Ind.

On the whole, producers' coöperation has not proved so successful as consumers'. Small establishments producing goods only as they are ordered have worked well. But attempts to found large coöperative factories, with hundreds of workmen producing for an uncertain market, have failed. The problems of capital, marketing, and management are too complicated to be wisely decided by a large group, and openings for attack by hostile interests are too numerous and vulnerable. Nevertheless there are in England over a hundred coöperative manufacturing enterprises, with products worth over $6,000,000 a year.

The coöperative marketing of products has helped solve many problems of the small producer. In Denmark this form of coöperation has spread rapidly, until it is hard to find a farmer who is not a member of at least one coöperative selling society. More than 40 per cent of the people of Denmark are members of these societies. The fruit growers of California and other western states, and potato growers and milk producers in various parts of the country, have worked out schemes of coöperative selling which have given them the savings of large-scale marketing and rescued them from exploitation at the hands of unscrupulous middlemen.

Banks on the Coöperative Plan

Coöperative banks, too, have proved successful in Germany and have spread to many other lands. These are of two kinds—one for the benefit of the lenders, which are popular with the middle classes and which frequently become little more than private banks, and one for the benefit of the borrowers, which find their greatest support among the poor. In America a type of coöperative bank known as building and loan associations has proved immensely popular (*see* Building and Loan Association).

There are also many societies which carry on coöperative enterprises but do not call themselves coöperative societies; in this group are included communistic religious organizations, friendly societies, fraternal credit associations, and others. To be a true coöperative society, the members must have the privilege of withdrawing at any time; hence socialistic experiments by the State, such as those undertaken by North Dakota under the influence of the Nonpartisan League, are not dealt with here.

COOT. A water-bird about 15 inches long with slate-colored plumage marked in white; also called a "mudhen." It is found in shallow reedy ponds and sluggish streams. The American coot is found in all parts of North America; it is migratory in the North, but resident in the South. In South America there are about six other species. The common coot of the Old World, found in Europe, Asia, and northern Africa, is black with a white bar across the wings, and a peculiar white bald spot on the forehead which has given it the name "bald coot." Coots differ from rails chiefly in having the toes edged with a scalloped membrane. (*See* Rail and Coot.)

COPENHA'GEN, DENMARK. A twelve days' trip from New York over the Atlantic and the North Sea takes us to Copenhagen (Danish *Kjöbenhavn*, "Merchants' Haven"), the charming capital and commercial metropolis of the little northern kingdom of Denmark. As we approach the narrow Sound which separates the island on which Copenhagen is situated from Sweden, we behold the beautiful gray towers of Kronborg Castle at Elsinore, famous as Hamlet's home. Long before the buildings of the city itself become distinguishable we see the gilded dome of the Marble Church glittering in the sun. This splendid edifice was begun in 1749, but for lack of funds was only completed in 1894. At the north end of the city we pass the great "free port," with its 11-story grain elevator and its numerous warehouses, where goods for re-exportation may be landed free of customs duties. A pleasant parklike promenade, the Lange Linie ("Long Line"), extends from the harbor along the Sound to the fashionable quarter of the city where the royalty live.

As we draw nearer we notice that there are no skyscrapers. But the skyline is pierced with many spires, so that Copenhagen has been called "the city of spires." These are found not only on the churches but on many of the public buildings, such as the Exchange, the Raadhus, the railroad station, and even on some of the hotels. On one of them (the Church of Our Redeemer) a winding staircase ascends outside the spire 295 feet to the top.

The excellent harbor of Copenhagen is formed by the deep narrow channel between the islands Amager and Zealand on which Copenhagen is situated. The city boasts many fine public buildings, museums, and art galleries. The Thorvaldsen Museum contains a collection of the works of Albert Bertel Thorvaldsen (1770–1844), the greatest of Northern sculptors. The University of Copenhagen, founded in 1478, is co-educational and free to all. It has a library of over 400,000 volumes, while the Royal Library in the Christiansborg Palace contains over 700,000 volumes and 20,000 manuscripts. Copenhagen has many learned societies for the advancement of science and art, and also a Woman's Club with a splendid building and 4,000 members.

Because of its splendid harbor and its wonderful location at the entrance to the Baltic Sea, and in spite of numerous fires and bombardments, Copenhagen has grown from a small fishing village, in the middle of the 12th century, to a flourishing commercial maritime city, with many beautiful suburbs. It was made the capital of the kingdom by King Christopher in 1443. In its harbor, in 1801, the English under Nelson destroyed the Danish fleet to prevent it from falling into the hands of Napoleon, and in 1807 the city was bombarded by the British fleet and a number of public buildings were destroyed.

The industries embrace ship-building, distilling and brewing, sugar refining, the manufacture of porcelain, soda, machinery, and textile fabrics. The chief exports are grain, butter, cheese, and cattle. Abroad, Copenhagen is perhaps best known as the home of Hans Christian Andersen, and as the source of the beautiful Copenhagen porcelain which has found its way all over the world. Population, about 510,000.

COPER'NICUS, NICOLAUS (1473–1543). In the little town of Frauenburg, Poland, in the month of May 1543, an old man lay dying. But on his face was a smile of perfect content, for he held in his hand a newly printed copy of his immortal book, to which for years he had devoted his best energies.

The man was Nicolaus Copernicus ("Koppernigk," in Polish), the founder of modern astronomy, and his book, which was in Latin, bore a title which may be translated, 'Concerning the Revolutions of the Heavenly Bodies'. In this work Copernicus proved —contrary to the beliefs of a thousand years—that the earth was not the center of the universe, around which moved the sun, moon, and stars. Our earth, he showed, is one of several heavenly bodies which, turning on their axes, all revolve about the sun.

The man who thus upset the teachings of the church and science alike was the son of a Polish trader. His father had died while he was still a child, but his uncle, a bishop of the Catholic church, had looked after the education of the lad. At the renowned University of Cracow, in Poland, he had studied mathematics diligently. Afterward he went to Bologna, in Italy, where he varied his study of church law with studies of the stars; and a few years later he studied medicine at the University of Padua.

Then he went back to Poland, and through his uncle's influence became a canon of the church at Frauenburg. Here he divided his time between the duties of his office, medical service to the poor, and the study of astronomy.

He had finished his great book, setting forth the proofs that the sun is the center of the universe, 12 years before his death. But at first he would not publish it, fearing lest he should be condemned as a heretic by the church. Finally one of his pupils persuaded him to give his book to the world, and a printed copy of it came to him just a few hours before his death. Although his views were at first bitterly opposed, today the Copernican system is accepted by all astronomers.

Michelangelo the great artist was born two years after Copernicus, and on the day that Michelangelo died (Feb. 18, 1564), Galileo the great defender of Copernicus was born. In the year that Galileo died, 1642, the illustrious Newton, who was to perfect the Copernican system, was born.

The RED METAL—MAN'S *Supple* SERVANT

COPPER was the first metal mastered by man, and next to iron it is still the world's most important metal. It is interwoven closely with the history of every advanced nation of modern times. It is first of all the electrician's metal. Without it the amazing progress of the past 50 years in electrical science would have been impossible. Over nearly all the world runs a network of wires transmitting electricity to carry cable, telephone, and telegraph messages; to furnish light and power; to run street-cars and trains. In the United States alone there are more than 22,600,000 miles of copper telephone wires. In addition, copper has many other important uses, in peace and war, on land and sea.

COPPER. Man early learned to work copper, for like gold and silver it is found locally in a pure state and can be beaten into shape even when cold. On the south shore of Lake Superior great masses of many tons' weight have been found, and copper was freely used by Indians before the coming of the whites. The metal is easier to work than iron, for it can easily be hammered into a desired shape or cast, or drawn out into fine wire. Alloyed with tin it gives us bronze, and so widespread was the use of bronze in early history that the period is known as the Bronze Age. The Egyptians used copper 5,000 years before Christ, and in museums are many weapons and other objects of bronze and copper even older.

Copper plays so vital a part in the making of guns and ammunition that, during the World War of 1914–18, Germany requisitioned nearly all copper kitchen utensils, door-plates, and door-knobs in the countries which it controlled. Combined with other metals, copper makes brass, bronze, and other alloys. Two parts of zinc added to eleven parts of copper makes "Dutch metal," an alloy so malleable that it is beaten out like gold leaf and used as a cheaper substitute for the latter. Alone, copper is used for electrical purposes, boilers, cooking vessels, etc. In thin plates it is used for engraving and etching, and in strong rollers for calico-printing. As an electro-deposit it is used in duplicating plates and type pages for the printing press (*see* Electrotyping). Every coin from the bronze cent to the gold piece has some copper in it. Various chemical compounds of copper are extensively used as sprays to kill fungi and insects, for all copper compounds, such as blue vitriol (sulphate of copper), are poisonous.

The Romans obtained their copper largely from Cyprus, an island in the Mediterranean, so they called it *cuprum*, from which our word "copper" is derived. Copper ores are widely distributed, being found in various countries of Europe, in Japan, Africa, Australia, and North and South America. More than half the world's supply comes from the United States.

The big copper mines in the United States today are amazing models of advanced method and equipment. Let us see what they are like by visiting in imagination the famous Red Jacket shaft of the Calumet and Hecla mine in northern Michigan. This is the richest mine of the Lake Superior district, which is unique because its copper is in metallic form.

Imagine a room 14½ by 24½ feet, walled with brick and cement and extending down nearly a mile below the surface of the ground. That is the shaft. It is divided, up and down, into six compartments. At one end are two elevators with double-deck cages for men and materials, and at the other end are two more cages, each provided with a nine-ton self-dumping "skip," or bucket, hanging below it. These "skips" are used to bring the ore up from the tunnels below, where it is mined. In the two compartments in the center are large cylindrical steel bailers through which the abundant water in the mine is brought to the surface.

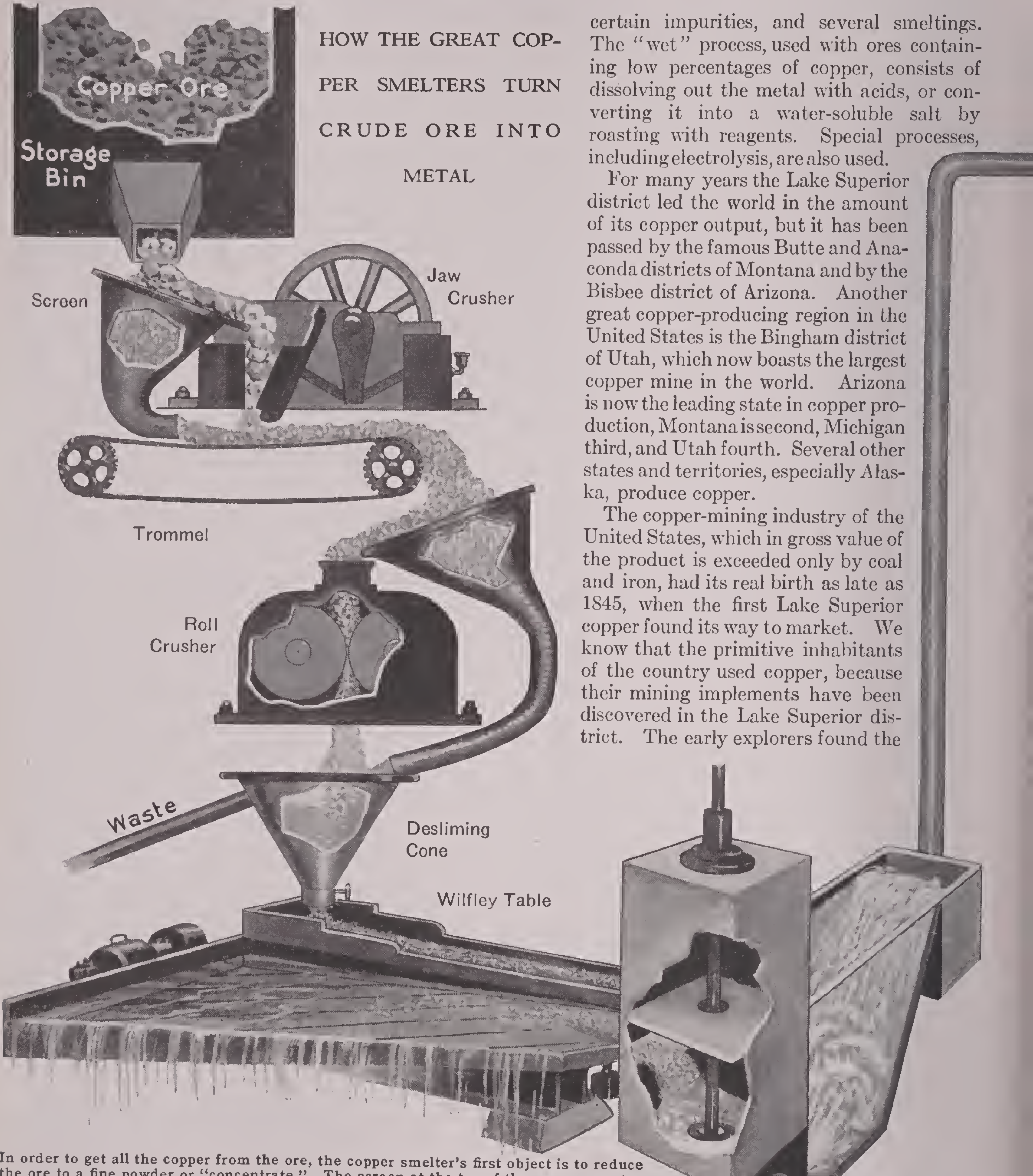
These elevators travel at a dizzy speed, much faster than the elevators in skyscrapers. At various levels they pass horizontal tunnels which run in various directions, and in which men are at work digging out the rock or ore which contains the metallic copper. Each of these tunnels is equipped with little railway tracks and electrically operated cars to haul the ore. Each has an elaborate system of water pipes and hydrants, with fire hose and chemical engines for use in case of fire, an electric alarm system, and telephones. At the ends of the tunnels the miners are loosening the copper ore by powerful hydraulic drills. A vast ventilating system is constantly forcing the air from the surface into the mine, for the temperature increases downward so rapidly that at the bottom of this deep shaft, which goes down nearly a mile, the temperature would be something like 90° F. if it were not artificially lowered. The "Red Jacket" is only one of the many shafts of this rich mining region, and one of them, the Tamarack No. 3, is the deepest continuous shaft known, more than 5,250 feet.

Copper ore is reduced to metal by various processes, depending upon the nature of the ore. The "dry" process consists of roasting to eliminate certain impurities, and several smeltings. The "wet" process, used with ores containing low percentages of copper, consists of dissolving out the metal with acids, or converting it into a water-soluble salt by roasting with reagents. Special processes, including electrolysis, are also used.

For many years the Lake Superior district led the world in the amount of its copper output, but it has been passed by the famous Butte and Anaconda districts of Montana and by the Bisbee district of Arizona. Another great copper-producing region in the United States is the Bingham district of Utah, which now boasts the largest copper mine in the world. Arizona is now the leading state in copper production, Montana is second, Michigan third, and Utah fourth. Several other states and territories, especially Alaska, produce copper.

The copper-mining industry of the United States, which in gross value of the product is exceeded only by coal and iron, had its real birth as late as 1845, when the first Lake Superior copper found its way to market. We know that the primitive inhabitants of the country used copper, because their mining implements have been discovered in the Lake Superior district. The early explorers found the

HOW THE GREAT COPPER SMELTERS TURN CRUDE ORE INTO METAL

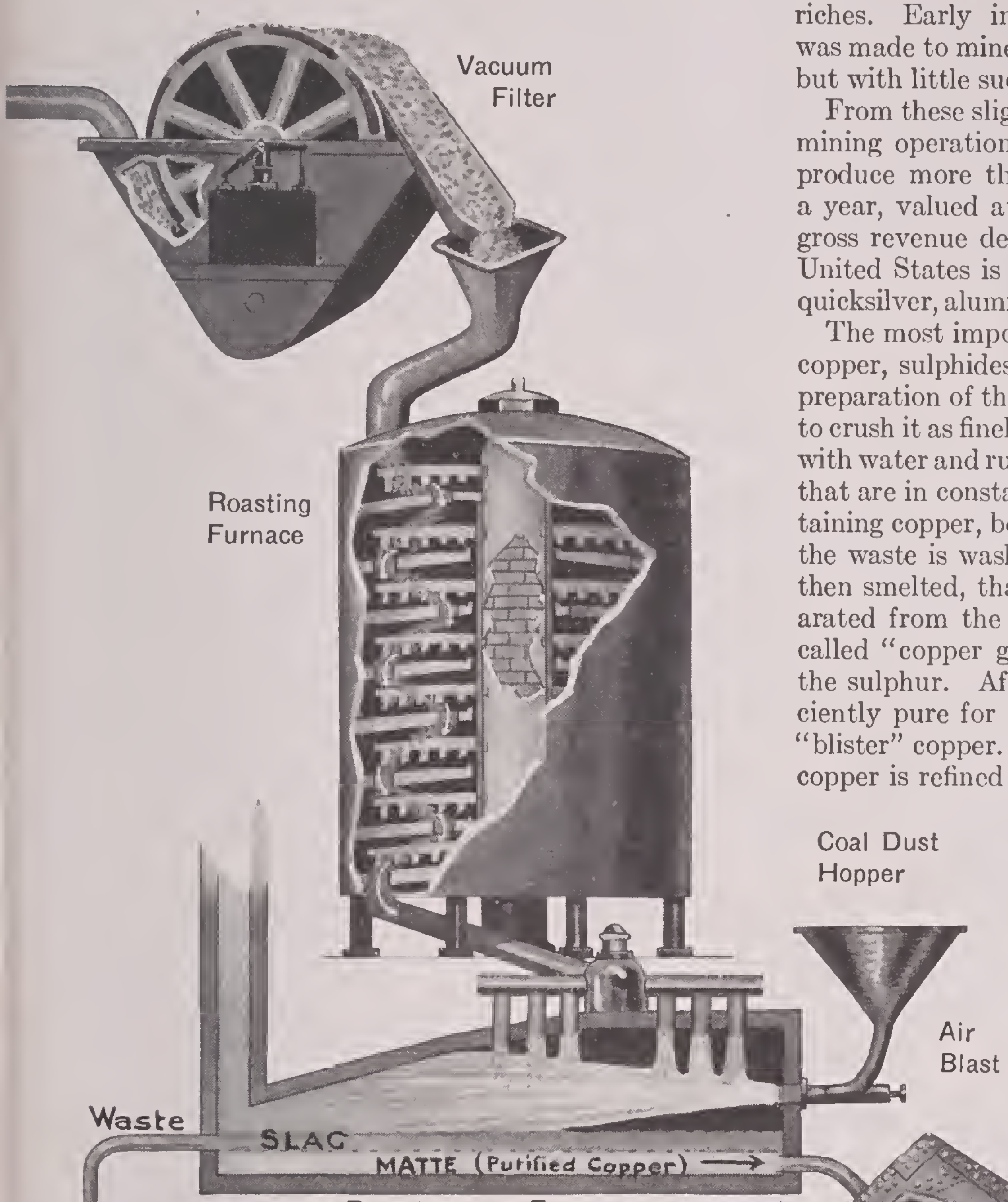


In order to get all the copper from the ore, the copper smelter's first object is to reduce the ore to a fine powder or "concentrate." The screen at the top of the page separates small pieces and sends the large lumps only through the jaw crusher. In the same way the rolling screen or "trommel" and the cone-like screen to its right sort the ore and send only pebble-like pieces through the roll crusher. "Jigging tables," not shown in the picture, meanwhile sort out all particles that are fine enough and send them direct to the furnaces. In the "desliming cone," worthless earthy material is thrown to the top dissolved in water, and overflows as waste, while the valuable portions go through to the "Wilfley table." This "table" sorts out "concentrate" ore for immediate roasting and sends the rest to a ball mill, not shown, to be reduced to sand. The sand then goes to the "flotation machine," where it is mixed with oil and pumped into rising water. The oil clings to the metallic portions and carries them up, while non-metallic earth sinks to the bottom. The metallic sand thus obtained contains the last of the copper in the ore, and goes to be roasted together with the "concentrate" previously obtained.

Indians using beads and knives of copper, and were told that the metal came from the northwest near a great lake. As early as 1765 the existence of great copper deposits on the shores of Lake Superior was definitely known, but it was 80 years more before any serious effort was made to exploit this great source of riches. Early in the 18th century some attempt was made to mine and smelt copper in New England, but with little success.

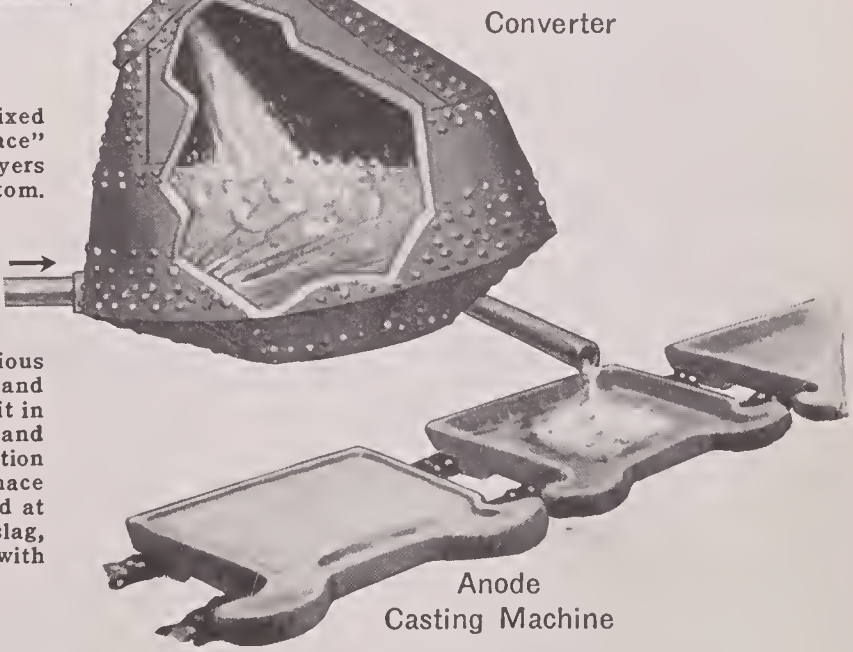
From these slight beginnings came the vast copper-mining operations of the United States, which now produce more than 2,000,000,000 pounds of copper a year, valued at nearly half a billion dollars. The gross revenue derived from the copper mines of the United States is greater than that from gold, silver, quicksilver, aluminum, and antimony mines combined.

The most important copper ores are native or pure copper, sulphides, and oxides. The first step in the preparation of the ore when it comes from the mine is to crush it as finely as possible. The ore is then mixed with water and run over tables, called "jigging tables," that are in constant vibration. The bits of rock containing copper, being heavier, sink to the bottom, and the waste is washed away. The concentrated ore is then smelted, that is, melted, and the copper is separated from the impurities. Sulphide ore, which is called "copper glance," is first roasted to drive off the sulphur. After two smeltings the metal is sufficiently pure for ordinary purposes, and is known as "blister" copper. To make the purest copper, blister copper is refined by electrolysis (*see* Electrolysis).



THE TWO INGENIOUS FURNACES

After passage through the "vacuum filter," the ore is mixed with all the fine concentrate and sent to the "roasting furnace" to be freed of sulphur. This furnace consists of several layers or "hearths" over which the ore passes from top to bottom. Hollow iron arms or "sweepers," cooled by streams of water inside, brush the ore about each hearth and then drop it to the next level. The burning impurities in the ore furnish heat for the process, and as the ore works to the bottom it gradually melts and loses most of its sulphur content. The resulting product is delivered to the "reverberatory furnace," which is one of the most ingenious machines of all. The copper charge lies along the bottom, and the fuel, instead of being burned on a grate, is blown over it in the form of coal dust. This provides fuel at every point and results in an even distribution of heat. Continuous operation of the furnace is insured by feeding the copper into the furnace through pipes in the top, so the furnace need not be opened at any time. The process results in a division of the charge into slag, or waste, and "matte," which contains the copper, mixed with metallic impurities.



PURE COPPER AT LAST!

In order to remove the metallic impurities, the "matte" is fed into a converter, similar to the Bessemer converter which changes iron into steel. Here a stream of air blows through the mixture from below, and carries the impurities out through the top. The molten copper is then drawn off into molds and cast, either for sale in that state or for further refinement by electrical processes in other mills.

COPPERHEAD. Be thankful that the rattlesnake gives you a warning, for there are snakes equally dangerous which have no such code of honor. Perhaps when out camping and gathering dry leaves and twigs to kindle your fire, you have found a sleepy, sluggish brown snake with a flat wicked-looking head of burnished copper color. This is the famous copperhead. If you leave him alone he will make his escape peacefully, but if you annoy him you run the risk of a deadly bite.

This venomous serpent, found in nearly all parts of the United States, is known by a great variety of names. In the South it is called cottonmouth because the interior of its mouth is white; in other localities it is known as the red viper, red adder, pilot snake, and copper-belly. It belongs to the pit-viper family (*see* Rattlesnake) and grows to a length of about four feet. The dark brown blotches on the light brown body are Y-shaped.

Copperheads feed on small birds and animals such as field mice. They generally sleep during the day and hunt their food at night. They spend the winter under rocks or in holes in the ground. The young are born alive late in the summer. Scientific name, *Ancistrodon contortrix.*

COPYRIGHT AND TRADE-MARKS. Even as late as the time of Shakespeare the law offered no protection to authors against printers who republished and sold their works without permission. Indeed it was not considered proper that gentlemen should receive pay for literary work, and many of them did not allow their works to be printed during their lifetime. Sir Francis Bacon published his essays only in order to forestall an unauthorized edition, and others of his time took the same course. Unscrupulous printers who wanted to publish Shakespeare's plays sometimes sent copyists to the performances to take them down in shorthand, and the author had no way of preventing this piracy. A law passed in 1709 provided the foundation of copyright laws in both England and America. It gave the author control over the printing of his works for a period of 14 years, with the privilege of renewal for 14 years more if he were alive at the end of the first period.

In the United States the Constitution authorized the federal government to issue copyrights, and in 1790 a law was passed similar to the English statute. Gradually copyright privileges were extended to artistic, dramatic, and musical works, as well as to literature. Finally in 1909 an act was passed repealing all previous legislation and providing comprehensively for the whole subject of copyright. Under this law the period was extended to 28 years, with a like renewal term, making 56 years in all. Copyright is effected by printing on the work the notice, "Copyright," with date, and sending to the Copyright Office, Washington, D.C., promptly after publication, a registration fee of one dollar together with two copies of the work, for deposit in the Library of Congress.

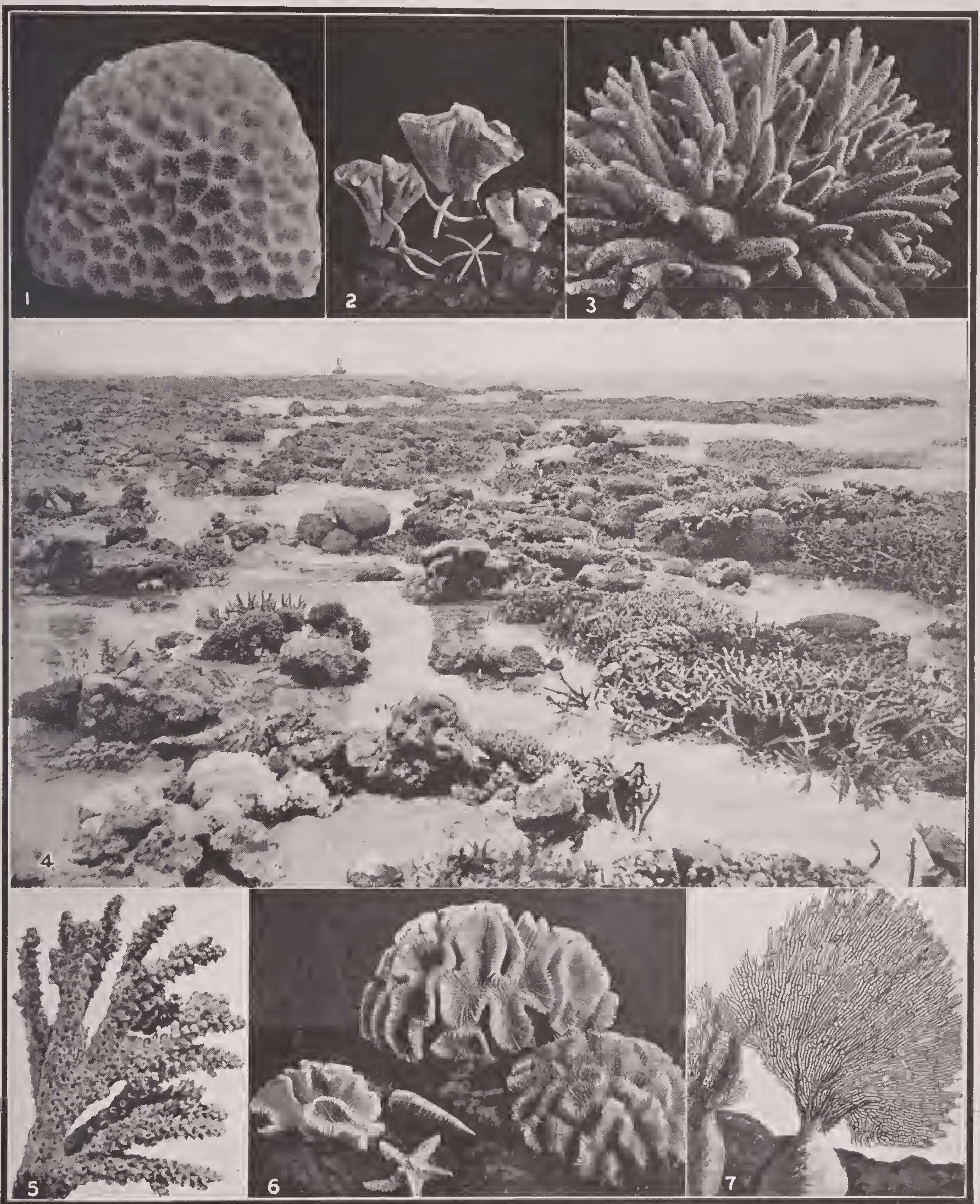
Since dramatic authors and music composers receive recompense for their work not so much from the sale of their printed works as through performances, the law extends copyright privileges to the performance of dramas, operas, and similar works. Dramatic copyright also extends to moving pictures, and composers' rights include phonographic records or other "mechanical music." Artistic copyright enables artists to control and profit from reproductions of their original picture, engraving, statue, photograph, or map. On maps, photographs, pictorial illustrations, etc., the notice of copyright may consist merely of the letter "C" in a circle, thus ©.

Until near the end of the 19th century foreign authors were imperfectly protected by copyright in the United States, and as a consequence American publishers flooded the market with English works. The evils of this system led in 1891 to an international copyright act, allowing citizens of other countries to have copyright privileges in the United States in case of reciprocal grants by other nations. In the case of publications in the English language, it is further required that the type for the American edition must be set in this country in order to obtain copyright.

Trade-marks, unlike copyrights and patents, do not involve monopolies. Everyone has the privilege of making soap; a trade-mark simply gives the public an easy means of identifying a particular soap, thus making advertising more effective and substitution difficult. Trade-marks which have been extensively advertised for long periods are often worth as much to their owners as more tangible assets in the form of real estate and buildings. In the United States, registration of trade-marks is in the Patent Office. It does not create the right to use the trade name or device, although it creates a presumption in favor of the user. Ownership is acquired solely by priority of adoption and continuous use. In some countries the person first to register owns the mark regardless of whether he was the first to use it, and in such countries it is a common practice for unscrupulous persons to register in their own names valuable foreign trade-marks, and then force the real owners to buy them out at high prices.

CORAL. Among the greatest architects in the world are the little coral-making animals, creatures of shallow water in the warmer seas. Small as are these tiny workmen, each one does his bit, until speck by speck a new land is created to become the home of man. If you visit the "keys" at the southern end of Florida you may see some of these islands in the making, looking like ocean gardens of wonderful beauty, below the water surface. You will see many leaf corals, and others shaped like huge vases; some branch out like the horns of a stag. The sea-feathers, near relatives of corals, branch in delicate tendrils like plants. Other near relatives are the gorgeously colored sea-fans. Beautiful as they are, however, these cannot be used for making beads and brooches. They lose their color upon being taken from the water and are not hard enough to take a good polish. The red

HOW THE TINY ARCHITECTS OF THE SEA BUILD THEIR HOUSES



Working patiently through the centuries, the little Coral builders live their brief lives and leave the walls of their dwellings to pile up gradually into giant reefs and charming islands. The middle picture (4) shows a portion of the Great Barrier Reef, over 1,000 miles long, which these tiny creatures have constructed east of Australia. Each Coral "skeleton" is really a densely populated city in which the Coral animals live together, filling up the space between their bodies with a lime cement which becomes part of the coral rock, when the colony dies out. The smaller pictures above show the many forms these colony skeletons take. We see, for instance, the Sponge Coral (1), in which each hollow marks the home of an individual polyp, the Cup Coral (2), and the Stag's Horn Coral (3). The Madrepore Coral (5) is particularly interesting on account of the unusual size of the individual polyps and their tendency to form trunks and branches that give the colonies the appearance of trees. The Leaf Coral, group (6), shows a superb specimen of the Noble Leaf variety in the middle. The beautiful Fan Coral (7) when inhabited is quite soft and flexible and waves in the water like a brightly colored palm leaf.

and delicate salmon-pink coral is a different species and occurs at its best only in certain parts of the Mediterranean Sea, off the coast of Africa and the west coast of Italy, where coral fishing is an important industry. The finest rose-pink in large pieces is valued at $400 or more an ounce.

The parent coral animal originates as an egg, and begins life as a free-swimming little creature, but after a time it settles down as a polyp on a rock or a piece of dead coral and begins to live like a plant, having lost its power of moving from place to place. Indeed, corals were thought for a long time to be sea-flowers. As a coral develops, little feelers like petals appear about the mouth. Day by day, stretching out these tender arms, the polyp catches and feeds upon the tiny organisms floating in the sea, and builds a solid skeleton with secretions of lime. A few kinds of corals continue to live as solitary individuals, but most of them live in vast colonies of many thousands of polyps so closely connected that you cannot see where one individual leaves off and another begins. The parent polyp produces little buds which develop feelers and stomachs of their own, and these in turn produce new buds—all remaining joined together into one great family, sometimes living for hundreds of years. Year by year coral skeletons accumulate, cementing together in one mass, until after centuries new land is formed consisting of the skeletons of billions of dead polyps. Fresh colonies are being continually formed by eggs which hatch and escape from the mouth of the parents and float off to attach themselves elsewhere. The flesh or living part of most corals is orange yellow in color, although the limy skeleton is pure white.

Coral islands and reefs are most numerous in the warmer portions of the Pacific and in the Indian Ocean, occurring to a less extent in the Gulf of Mexico and along the shores of the West Indies. According to their various forms, they belong to three classes. "Barrier reefs" lie at some distance from the land, the space between being filled by a shallow lagoon of salt water. Usually some parts of the reef rise above the ocean as islets, supporting a scanty vegetation, while the greater part is submerged. The Great Barrier Reef of Australia, over 1,000 miles long and 10 to 90 miles in breadth, is an illustration of this type. "Atolls" are not attached to any visible land. They are circular in form, surrounding a central lagoon of placid transparent water. When, as usually happens, there are passages through the reefs, they form an excellent harbor for ships during a storm. "Fringing reefs" simply skirt the coast line and extend the beaches.

Corals are closely related to the sea anemones, belonging to the class *Anthozoa* of the division *Coelenterata*. Often assisting much in the formation of coral islands are lime-forming seaweeds, as well as other polyps of the class *Hydrozoa*.

THE CLEVER NEIGHBOR OF THE CORALS

This cheerful crab lives safely among the corals because he is disguised to look like them, and so escapes his foes.

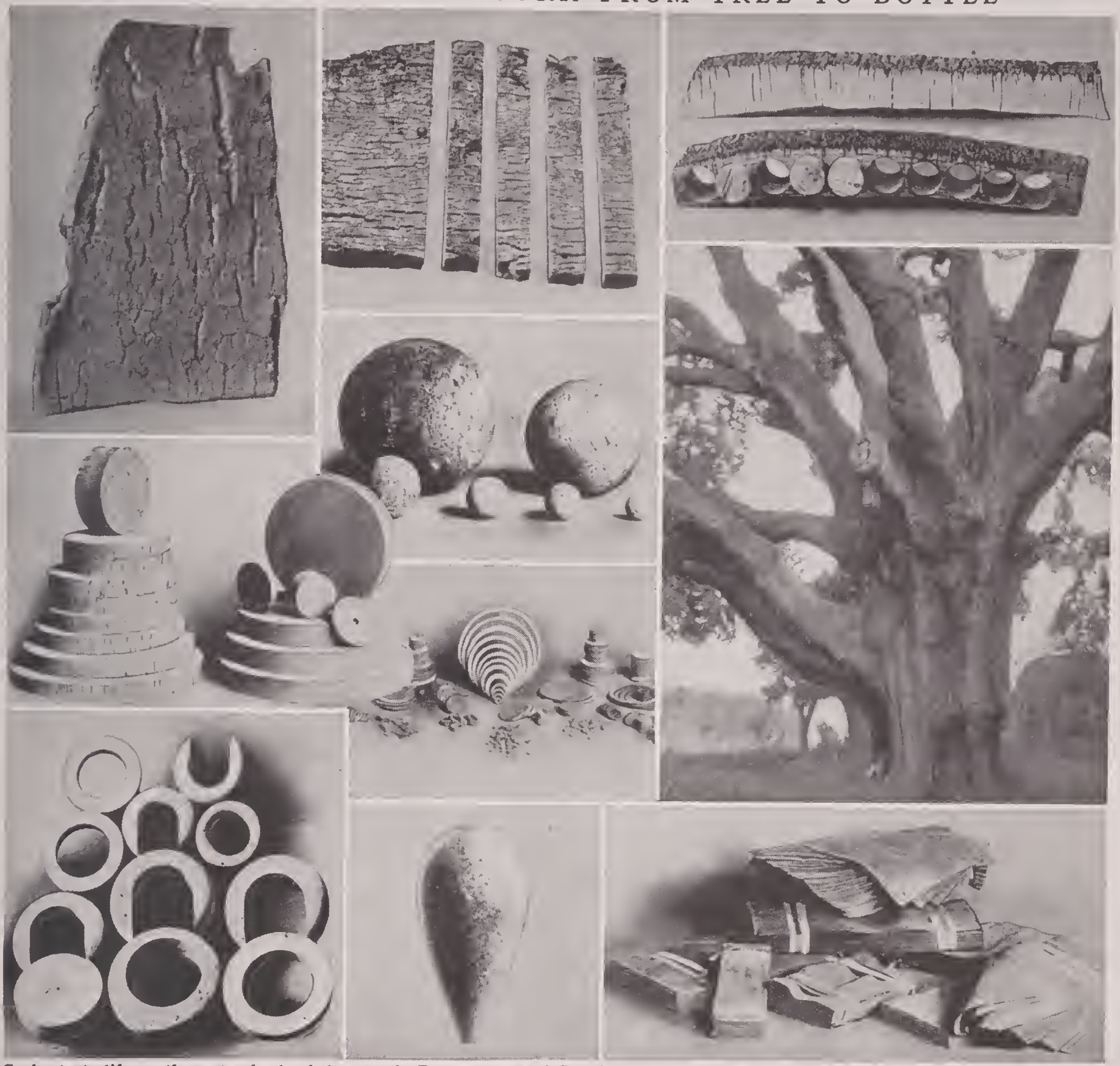
COR'INTH, GREECE. No other city in ancient Greece held so commanding a position as Corinth, for it was situated on the Isthmus of Corinth, the narrow neck of land connecting northern Greece and the Peloponnesus, and between the two gulfs, the Corinthian on the west and the Saronic (or Gulf of Aegina) on the east. The Corinthians were for long the leading naval power of Greece, and one of the foremost colonizing states, founding among others the famous colony of Syracuse on the island of Sicily. Corinth was also noted for its extensive commerce and its manufactures; its richly ornamented vases and metal-ware were exported to many lands. The most ornate order of Greek architecture is appropriately called "Corinthian" and was said to have been invented by a Corinthian architect, after seeing a basket upturned amid acanthus leaves (*see* Architecture). But wealth brought luxury, and with luxury came vice.

The Romans destroyed Corinth after crushing an uprising in 146 B.C., and carried away many of its art treasures. A hundred years later it was rebuilt by Julius Caesar and again became a great trading center. The apostle Paul came as a missionary to Corinth and founded a church there, and it was to its members that he afterwards addressed his Epistles to the Corinthians.

Corinth passed into the hands of the Turks in the 15th century, was burned in the Greek war for independence in 1822, and was again destroyed by an earthquake in 1858. Most of the splendors of Corinth have thus disappeared, but excavations have brought to light the remains of the ancient theater, the massive temple of Apollo, and a few other buildings. Population, about 5,000.

The modern city of Corinth is about three miles northeast of the old site. A four-mile canal through the isthmus, completed in 1893, has improved Corinth's natural advantages as a trading center and it has once more begun to thrive. The canal shortens the voyage from the Adriatic to the port of Athens by 202 miles but the difficulties of navigation lead large steamships still to go around Cape Malia.

HERE'S THE STORY OF CORK FROM TREE TO BOTTLE



Cork starts life as the outer bark of the stately Portuguese and Spanish cork-oak trees, like the one shown at the right. When thick enough, the bark is peeled off in slabs, such as you see in the upper left-hand corner. These slabs are sliced into strips and from the strips corks are punched. Spheres for centers of baseballs, washers for machines, fishing line floats, and thin sheets for cigarette tips are cut by special machinery.

CORK. It seems strange that while some kinds of oak trees give us one of our heaviest common woods, another kind should supply us with cork—a substance so light that life preservers are made of it and floats for fishing seines. The cork-oak forests of Portugal, which contribute nearly one-half of the world's annual crop, cover an area greater than one-fourth of Massachusetts. Thousands of men find work in the deep shade of the gnarled old trees, with their evergreen leaves and their rough trunks covered with thick gray bark. New layers form rapidly, so that a fresh sheathing from ½ inch to 2½ inches thick is ready for cutting every nine or ten years. The trees are about 20 years old when they yield their first crop, which is so rough and coarse that it is worth little. The second stripping gives a better quality, but the best harvests do not come until the oak is about 40 years old.

The stripping is usually done in July or August. With a sharp knife or hatchet a cut is made around the trunk near the base and another just below the branches. These cuts must not injure the inner layer or the trees will stop growing. The two incisions are joined by long lengthwise cuts. Then, inserting the wedge-shaped end of his hatchet handle, the workman pries off the sheets. The branches yield a thinner layer, but one of fine quality. Anywhere from 45 to 500 pounds of cork may be taken from a single tree.

After seasoning for a few days, the cork sheets are boiled in great vats to remove the tannic acid and to soften them so the hard outer covering can be removed. At the seaport the bark is pressed into bales and loaded on vessels. At the factory the slabs are softened by steaming, sliced into strips by circular steel knives, revolving hundreds of times a minute, and from these strips the "corks" for bottles are cut by other machines.

The valuable properties of cork—its lightness, elasticity, and impermeability to water—are due to the fact that it is made up entirely of thin-walled cells filled with air. Today the list of useful articles made from cork is a long one. Glass manufacturers polish their wares with cork wheels, artificial limbs are made of cork, and cork paper (so thin that 500 sheets make one inch) is used for the tips of cigarettes. Since cork is a very poor conductor of heat and cold, helmets of cork are worn by white men in the tropics as protection against sunstroke. Ground cork is used as the basis of a number of cements and coatings for insulating steam pipes, and in constructing refrigerators, etc. Another important use is in the manufacture of linoleum, which is made from ground cork and linseed oil (*see* Linoleum and Oilcloth). The coarsest grade of cork waste is used to pack china and fresh fruit. Parings of cork, burned in closed vessels, make Spanish black, a beautiful and durable paint.

Scientific name of cork-oak, *Quercus suber*. The tree attains a height of from 20 to 60 feet and is sometimes as much as 4 feet in diameter. The leaves are evergreen, oblong, somewhat oval, downy underneath, and waved.

CORK, IRELAND. The third city of Ireland and its greatest seaport, Cork is situated on the southern coast of the island, its magnificent harbor being the estuary of the River Lee. Vessels of more than 20-foot draft, however, cannot reach its quays, but unload at Queenstown which lies on an island near the harbor's mouth. For American travelers Queenstown is usually the first European port of call, as most of the big liners touch there.

The name Cork, which means "swamp," was no doubt once merited by the site. Today the ceaseless activity of the shipping, the calm island-crowded waters and wooded shores dotted with resorts, make Cork harbor a charming picture. The city has thriving manufactures of leather, iron, glass, gloves, textiles, and fertilizers, large shipyards, distilleries, and breweries. There are many fine churches, both Protestant and Catholic, and several attractive government buildings. The city is also the seat of University College. Part of the business section was burned in 1920, after a conflict between the Royal Irish Constabulary and Sinn Fein forces.

Cork was founded about 600 A.D. It was frequently pillaged and for a time occupied by the Northmen in the 9th and 10th centuries. Until 1172, when Ireland acknowledged the sovereignty of King Henry II of England, Cork was ruled by native princes. By a charter of Edward IV, the lord mayor of Cork was created admiral of the port. In acknowledgment of this a ceremony is held every three years, in which the mayor throws a dart over the harbor. Population, about 77,000.

The county of Cork is the largest county of Ireland and is famous for its dairy industries. A few miles from the city, within the ruins of an old castle, is the famous Blarney Stone, popularly supposed to give to those kissing it the power of persuading others by clever flattering speech.

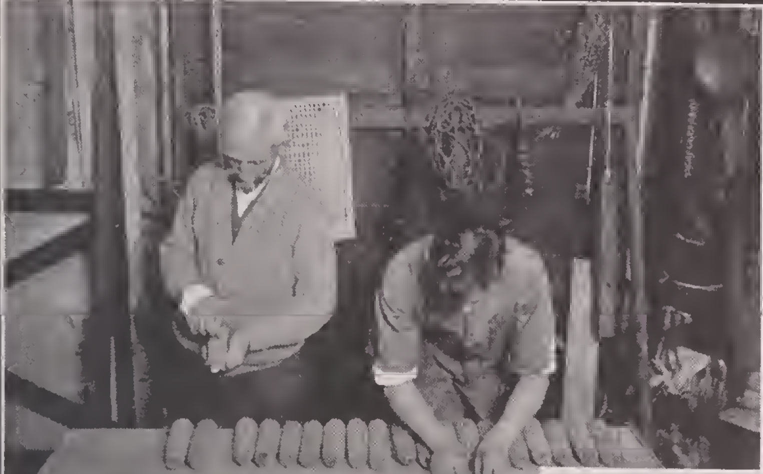
Where KING CORN *Holds* BOUNTEOUS SWAY

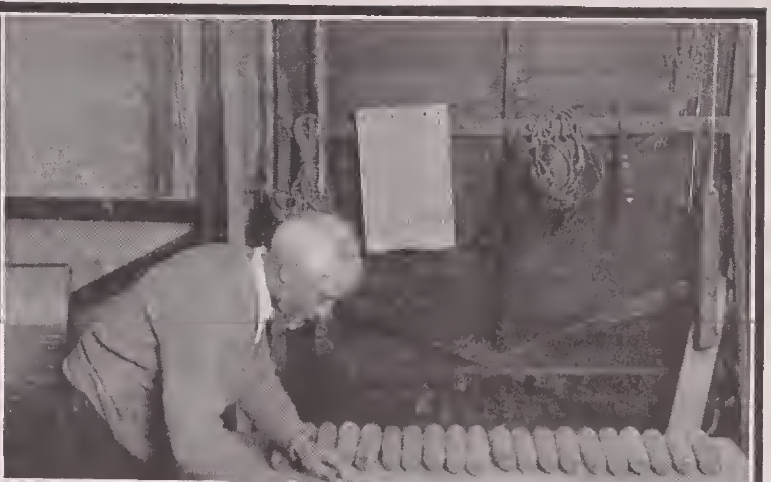
If King Corn should give you a peep into his treasure house just after a harvest season, you would surely think that King Midas of old had again been at work with his touch of gold. In one year the American farms grow a fortune in corn so great that it would purchase all the coal, iron ore, and petroleum produced in this country in the same time. And then there would be enough left over to purchase the year's output of all its gold and silver mines. If it should happen to be a "bumper" crop, there would then in addition be enough left to buy every automobile built in the American factories in a year, from the smallest car up to the most wonderful "palace on wheels." In one year recently the corn crop brought more money than the wheat, cotton, potato, and rye crops combined.

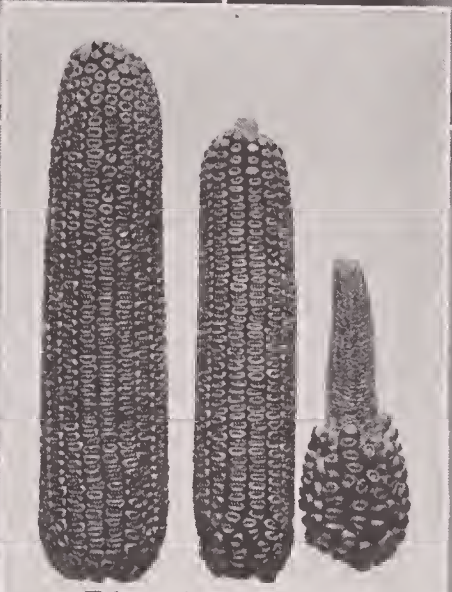
CORN. The richest part of King Corn's dominions is the great Mississippi valley of the United States, where three out of every four bushels of the world's supply of corn are produced. The very center of his kingdom is in the eight states of Illinois, Iowa, Indiana, Ohio, Nebraska, Missouri, South Dakota, and Minnesota, the famous "corn belt." In this vast area, in the growing season, glistening cornstalks stand rank on rank like some strange army for hundreds of miles. They hold themselves proudly erect with a military bearing. Only the golden-plumed crests nod jauntily as the wind passes by, and the broad green leaves rustle sociably in a continual gossip with the stray breezes as they dance down the corn rows. In very truth this is an army—an army of fortune makers for the farmers of King Corn.

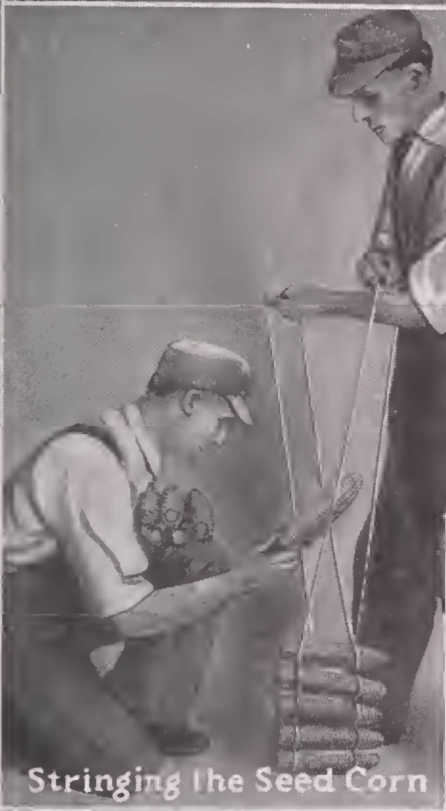
Do you wonder why you do not hear more about this wonderful fortune in corn? The chief reason is because the bulk of the corn harvest is not traded off in central exchange markets like wheat. In fact, only a small part of the crop leaves the farm at all. The great stock-feeding district of the country is in the corn states, and four-fifths of the three-billion-bushel corn crop is used in fattening live stock. So the greater part of the crop goes to market on four legs, you might say. The story of corn is read between the lines in the market reports on beef and pork. If there is a good crop of corn the report says, "Meat will be plentiful," but if the corn crop fails it says, "Meat will be scarce, poor in quality, and high in price." Not only the corn itself is fed to stock, but the leaves and the stalks are fed as fodder also, and are especially valuable when stored green in silos and allowed to ferment. (*See* Silos.)

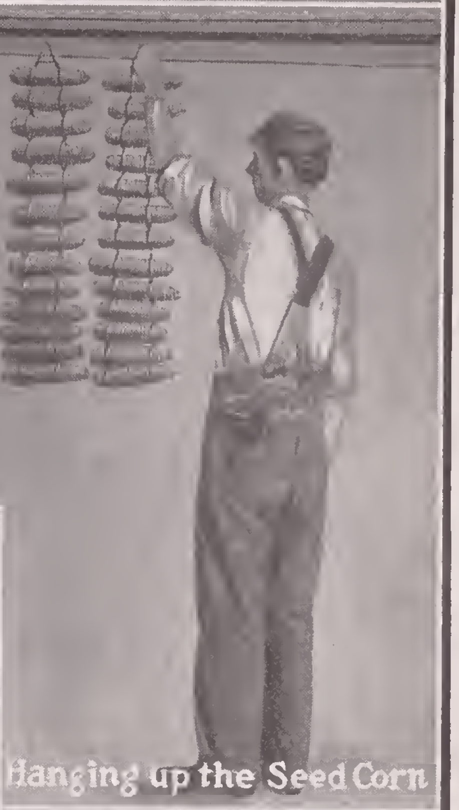
ASKING THE "RAG DOLL" ABOUT THE CORN CROP

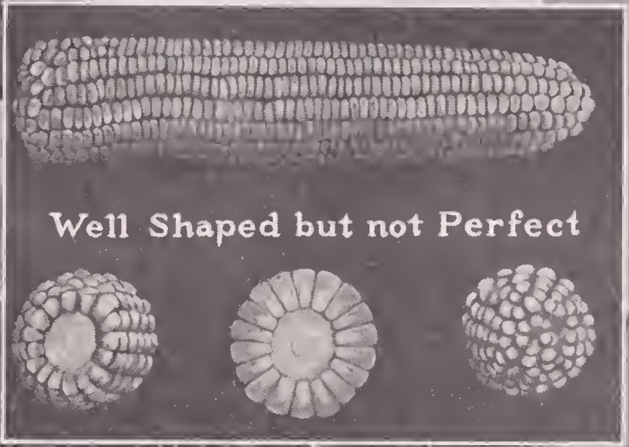

Selecting the Kernels


Rolling up the Rag Doll


Blood Will Tell


Stringing the Seed Corn


Hanging up the Seed Corn


Well Shaped but not Perfect

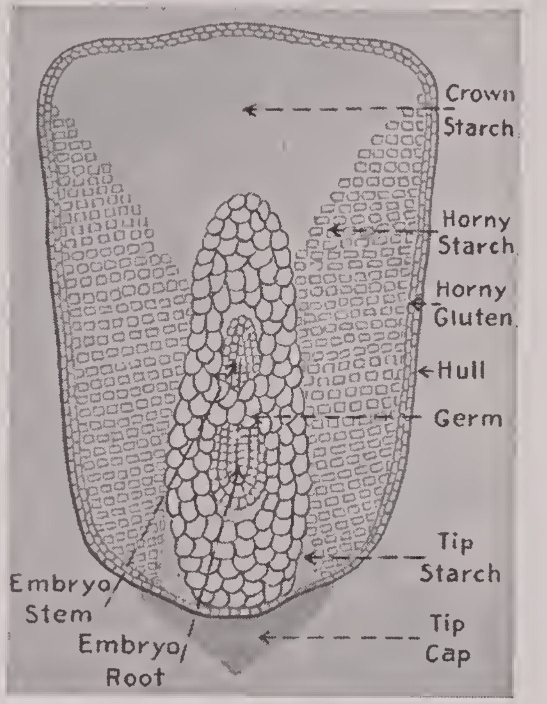
Picking Out the Best

Testing the Planter

Scientific selection of seed corn has done more than anything else to improve the American crops. One of the simplest ways of testing seed is shown here. A long strip of cloth marked off in numbered squares is laid on a table. Six sample kernels are taken from each of the sample ears and grouped together in the squares. Then the cloth is rolled up into a bundle which is called a "rag doll," and soaked with water. After a week or so, the "rag doll" is opened and tells you by the size of the sprouts which are the strongest ears. Those ears are then selected for seed, and are strung up for storage as shown in the side pictures. Below, the seed kernels are being picked over before planting, and the mechanical planter is being tested. The pictures in the middle show the difference between corn grown from selected seed and corn from "just any old seed."

What becomes of the rest of the corn crop? Much of it is turned into human food in the form of corn flour or corn meal, or, with the hull removed and the inside of the kernel coarsely crushed, it becomes hominy (also called "samp") or hominy grits. Another form of home-made hominy is prepared from the whole grain by removing the outer covering with lye and cooking. But there are countless other things made from corn, some of which have nothing to do with food at all.

STRUCTURE OF A CORN KERNEL



The central germ element develops this structure into a complete plant.

What the Kernel Contains

Let us split a kernel of corn in two. We find it consists of three parts—a hard horny hull, a small germ at the point, and a white body. Each of these has its special uses. The hull forms a sort of bran; the germ yields oil, and the white body gives us starch and gluten. The bran is used for little else than cattle food, but the other substances are rich in many products.

Corn oil is refined for salad and cooking purposes, or made into oleomargarine. Inferior grades may be used for soaps, or for glycerin, and perhaps nitroglycerin, from which dynamite is manufactured. From the corn germ there is also extracted a gum called "pargol," much used in making substitutes for rubber. Elastic sponges, rubberoid shoe soles, and erasers are often corn products. The oil cake which remains after pressing out the oil is extensively used for fattening cattle.

Corn starch is most in evidence in the form of puddings and stiff linen collars, but it may also be put through a process called "hydrolizing," which produces glucose, corn syrup, and other sugary substances, as well as certain gums used on envelopes and stamps, or for holding together the sand in making castings (*see* Glucose; Starch).

Corn gluten gives us vegetable glue and the gluten meal which is often mixed with corn bran as a cattle food. Corn cobs are often used as bowls for tobacco pipes, and part of the stalks and leaves are used in making paper, mattresses, and packing materials. The pith has been used even in building war vessels, for compressed blocks of it are packed under the armor plate to swell and stop leaks if the armor is pierced.

Before any of his wealth is distributed, King Corn expects his farmers to select the very choicest of the yield for seed to plant the following year. It is a serious blow to his pride that the average yield on the American farm is only 30 bushels or less to the acre—really only half a crop. Careless selection of seed is largely responsible for this. To give a practical demonstration of what can be done, Uncle Sam organized corn clubs among the boys and girls, telling them how and when to select the ripened seed ears, how to test for proper germination, when to plant, and how to cultivate and care for the growing plant. The result was that some of the boy farmers raised from two to four times as much corn to the acre as their fathers grew on adjoining fields. Some of these youthful corn-growers came near to the world's record—237 bushels to the acre.

America's Gift to the World

Corn or "maize" (as it is usually called in other countries) is a gift of the New World to the Old, for it is generally believed to be a native of the warmer portions of America. When America was discovered the Indians were cultivating corn, their favorite food, and so it is often called Indian corn. Columbus is said to have carried the first grains of it to Europe, and the Indians taught the colonists how to grow corn and prepare it.

Corn was such a good friend to the Indian that even the braves of the tribe joined the squaws in the harvest season to bring in and husk the corn. The song of Hiawatha chants the glories of the maize-field from the time when first its—

> . . . . small green feather
> From the earth shot slowly upward . . . .
> Till it stood in all the splendor
> Of its garments green and yellow,
> Of its tassels and its plumage,
> And the maize-ears full and shining
> Gleamed from bursting sheaths of verdure . . . .
> And the soft and juicy kernels
> Grew like wampum hard and yellow.

The Indians had several different varieties of corn and many others have been developed. Now there are more than 1,000 named varieties of the plant, from the Golden Thumb popcorn, growing about 18 inches tall, to the field corns, which sometimes reach 22 feet or more. Some varieties have ears with only four rows of kernels; others have as many as 48 rows. The range of colors is almost unlimited. For the table we have numerous varieties of the familiar sweet corn, which have less starch and more sugar tucked away in their kernels, as well as the toothsome popcorns whose kernels have the gift of turning inside out when put over a hot fire. Canned corn is one of the most important preserved foods in America, millions of dollars' worth being marketed each year. Sweet corn mixed with beans makes succotash.

The corn plant can so adapt itself that it grows in every state in the Union. Some kinds mature in less than three months in the northern states, while those

CAN YOU PICK OUT ALL THE CORN PRODUCTS SHOWN HERE?

Of course you know corn meal and corn starch, that mother uses in cooking. But did you know that the corn germ yields an oil which is used in making soap, butter substitutes, and glycerin? Or that a gum obtained from the germ is used in making artificial soles for shoes and "red rubber" sponges and erasers? Or that the gum used on letters and stamps is a corn product, and that paper is made from corn stalks and leaves? Finally, not only the corn-cakes you eat, but a much-used variety of syrup for them are gifts from King Corn.

of the South require five months' growing season. With proper selection the composition of the kernel may be greatly altered. The oil content of one kind has been increased, making it of special value in the manufacture of corn oil and in fattening live stock. For other purposes the proportion of starch has been increased. New varieties with special values are continually being developed by scientific methods.

The main types of corn are *pop*, *flint*, *flour*, *dent*, *sweet*, and *pod* corn. The pod corn is probably nearest to the parent type.

In England the word "corn" is used chiefly to denote wheat; it was originally applied to all kinds of grain used for making bread. Argentina is the greatest corn-exporting country, since little of the great American crop leaves our shores. Other important corn-growing nations are Mexico, Rumania, Hungary, Italy, Egypt, and India. Corn is a member of the grass family. Scientific name, *Zea mays*.

CORNEILLE (*kŏr-nā'ye*), Pierre (1606–1684). Often called the "father of French tragedy," Corneille was at the same time very nearly as important in forming and defining French comedy. It was he who first sharply separated comedy from tragedy, and his great tragic dramas are very serious matters indeed, filled with mighty incorruptible heroes, who stalk their dignified way through tremendous happenings, with nothing funny or light or whimsical to relieve them. For this reason we do not look to Corneille to show us all the strange thoughts and feelings that may pass through a man's mind, or how one character may be both weak and strong, good and bad, at the same time; or to give us a view of events which we might recognize as lifelike and natural. But on the other hand, Corneille is a real "tower of strength."

His oratorical verses sweep along with the power of a mighty wind; his thoughts stand out with the clearness, majesty, and firmness of a great bronze statue. His greatest work is 'The Cid', which caused a long and famous argument among the critics. The story of this play he borrowed from a Spanish writer, just as Shakespeare often found his plots in old stories of other nations. Corneille's plays were very popular, even though the great Cardinal Richelieu always hated him and tried to destroy his fame.

Corneille was born at Rouen, in Normandy, and was married and spent most of his life there. He lived in a calm, middle-class, inelegant fashion, very different from the "grand manner" of the sounding dramas which he wrote.

Corneille's chief works were: 'Médée' (1635); 'Le Cid' (The Cid), 1636; 'Horace' (1640); 'Cinna' (1640); 'Polyeucte' (1641); 'Le Menteur' (1642); 'Andromède' (1650); 'Don Sanche d' Aragon' (Don Sancho of Aragon), 1650; 'Oedipe' (1659); etc.

CORONADO (*kôr-ō-nä'dō*), FRANCISCO VASQUEZ (about 1500–1545). Twenty years after intrepid Cortez had conquered Mexico, and at a time when De Soto was still in the midst of his tragic struggles with hostile Indians, privations, and disease in the Mississippi wilderness, a company of gayly bedecked horsemen in shining breastplates and helmets set forth (Feb. 24, 1540) from a little town on the western coast of Mexico, to explore the country lying to the northward. About 800 Indian and negro servants accompanied the 300 soldiers, and innumerable baggage wagons and pack-horses and great herds of cattle and flocks of sheep were taken along as necessary supplies. At the head of the expedition rode Francisco Coronado, the first white man to penetrate to the great plains west of the Mississippi and to see the vast herds of "humpbacked cattle" (buffalo) which long roamed over that region.

Coronado set out with high hopes. The year before, a monk named Fray Marcos had brought back marvelous reports of "Seven Cities of Cibola," whose fabled magnificence he had viewed from afar. So Coronado expected to conquer an empire rivaling in riches that conquered in Mexico by Cortez, and by Pizarro in Peru.

What a disappointment awaited him! After leaving behind the slow-moving baggage train, Coronado and his horsemen toiled on through an inhospitable country, which steadily grew worse. The first of the Seven Cities was reached and after a fierce but short fight was taken. But here was no rich and thriving people, such as had been described—no treasures of gems or gold. The people were poor agriculturists, destitute of wealth; for the fabled "Seven Cities" were merely unimportant Indian pueblos built of sun-dried brick.

One of the exploring parties sent out by Coronado in all directions came to the Grand Canyon of the Colorado, now for the first time visited by Europeans. Others discovered other Indian pueblos similar to Cibola, but in none was there any gold.

In one of these Indian villages, however, was found an Indian slave who said he was a native of Quivira, a rich and populous place far away to the northeast. Spurred on by this tale Coronado again set out and presently came to a limitless plain. Afraid to trust his whole army here with only a scanty food-supply, he picked a little band and sent the rest back to the Indian villages.

For weeks Coronado and his handful of followers pushed forward over "mighty plains and sandy heaths, smooth and wearisome and bare of wood." It was here that they found countless herds of "humpbacked oxen" or buffalo. After reaching a point probably not far from the southern boundary of the present state of Nebraska, he was told that he had reached Quivira. Instead of a populous city, it was only a little group of Indian wigwams made of buffalo hides; and the Indian slave paid with his life for the false hopes he had excited.

By this time Coronado was convinced that through the whole expedition he had been the victim of travelers' idle tales. On the way back he lost all control over his army, who deserted him singly and in companies. With less than 100 ragged followers he at last reached Mexico City in the autumn of 1542. Although he had failed to find any of the things for which he went in search, he had added to the world known by Europeans a vast extent of territory, he had acquired for Spain a claim to all this land, and his romantic march stands in history as one of the most remarkable exploring expeditions in American history. (For Coronado's route, *see* map in article United States History.)

Little is known of the life of Coronado excepting that part spent in this exploration. He was a gentleman from Salamanca, Spain, who came to New Spain in 1535. By a brilliant marriage he became a leading nobleman and in 1539 was appointed governor of the province of New Galicia. A full account of his exploration was written by one of the soldiers of his army, and besides this we have Coronado's own letters to Charles V, the Spanish king.

COROT (*kō-rō'*), JEAN BAPTISTE (1796–1875). Some fifty years ago a straight handsome old gentleman in a peasant's blue blouse, with long white hair like an aureole about his kind happy face, was a familiar sight on the streets of Paris. And often strollers in the fields bordering the city came upon him at work before his easel, for this was the artist Corot whose lovely landscape pictures we all know.

"Father Corot," as he was lovingly called by his many friends, was a good saint to every needy young artist. In those years his pictures were selling for thousands of francs apiece and his greatest pleasure, next to painting them, was in giving away the money they brought him.

"I can earn the money again so quickly, just by making a little branch," he said. "I work better with a heart at ease. Once I gave away a thousand francs—a good deal for my little hoard just then—but the very next day I sold a picture for six thousand. You see it brought me good fortune."

The tranquil landscapes Corot loved to paint reflect his own happy life. He never suffered privation nor lacked friends. Although there were long years when only his pupils and fellow artists found beauty in the quiet tones and shades in which he painted misty dawns, hazy trees, and mirroring waters, yet he was quite satisfied if only he could put on canvas nature's beauties as he saw them. "I am only a skylark singing little songs in my gray clouds," he once said. He did not know that in after years his pictures would be described as "painted music," and that people would speak of him as the "lyric artist." Honors were heaped on him in later life, for he won several medals and was made an officer of the Legion of Honor.

Corot is the most popular and probably the greatest of the group of artists known as the "Barbizon school," so named because they did much of their work at the little village of Barbizon on the edge of the Fontainebleau forest. His paintings are widely distributed; the United States has its share. Boston's Art Museum displays the famous 'Forest of Fontainebleau'; the Chicago Art Institute has several, among which is 'Just before Sunrise'; the New York Metropolitan Museum has 'The Moat', and 'Ville d'Avray'. The popular 'Dance of the Nymphs', which is reproduced with the article on Fine Arts, is in the Louvre, Paris.

CORPORATIONS. "Corporations have no soul." To most of us this old saying calls up the memory of caricatures in which the business organizations legally styled corporations but popularly called "trusts" are represented as giant monsters, greedy and grasping, reaching out in all directions for everything that they may devour, and utterly soulless in their disregard for the rights of others. But when this idea of the "soullessness" of corporations first arose, in the 13th century, it carried with it no such evil meaning; and even today this picture of a great "bogyman" can be applied, if at all, only to those business corporations which are monopolies. In the Middle Ages, indeed, the most common corporations were churches, monasteries, and towns, and they were devoted to serving the interests of the people.

For more than a thousand years, lawyers had been wrestling with the rights and duties of groups of individuals who acted in permanently organized bodies. Suddenly a lawyer conceived the idea that such a group, which owned property and transacted business in the name of the group, was really an artificial or fictitious *person* in its rights and duties. But being only a fictitious person (and not a real one), a corporation "has no soul" either to be saved or lost. An incorporated town might do homage to its lord as a vassal, though no one of its citizens took the oath of fealty as an individual. A monastery as a corporation could own vast estates, though every one of its monks had individually taken the oath of poverty. No will or right of inheritance was necessary to hand its property over to the next generation of monks, for the corporation itself never dies, though every member of it changes. And of course there is neither "marrying nor giving in marriage" in the case of a fictitious person.

This idea of a corporation solved the difficulties of the medieval lawyers and it has made possible the giant business organizations of today. To carry out these great undertakings vast sums of money are necessary, which can usually be best secured from many people. But no one would invest his money in such a venture if each individual were responsible for all of the debts of the business, or for the acts of every other member, as in a partnership. He is willing, however, to put in some of his money because he knows that although the business fails, the rest of his property is safe.

Ever since the 13th century corporations have continued to be regarded legally as persons. Accordingly the organization may buy and sell property, may borrow and lend money, may sue and be sued. It may even commit a crime for which it can be punished by fine or dissolution.

Because of the advantages of a corporation over a partnership, the number of corporations today is legion. Thousands of cities and towns are "public corporations." Our colleges and our churches, our hospitals and our charitable institutions, are managed by the trustees or directors as "eleemosynary corporations." Our water, heat, light, and transportation are furnished to us by "public service corporations." More than one-half of the stores and factories of the United States are owned by "private corporations."

Corporations are formed under charters or other grants from the government. In the United States charters are granted by the states, usually under a general act of incorporation which lays down the conditions with which the company must comply. These conditions differ in different states, and formerly they might differ for each corporation in the same state; for originally each charter was granted by a special act of the legislature. In the charter the corporation receives a name of its own under which it does business, and it has a seal with which to attest the acts of its officers. The members (stockholders in the case of business corporations) have the right to make by-laws for the organization, and to decide important questions such as the issue of stock. But the decision of most questions of policy is left to a board of directors elected by the members, and the carrying out of these decisions is entrusted to a salaried manager, president, or secretary, selected by the directors. Although a corporation cannot die, it may come to an end by the expiration of the term fixed in the charter, or by the members voluntarily surrendering their charter to the government from whom they obtained it.

The act of incorporation has been held by the Supreme Court of the United States to be a contract between the state and the corporation, and it cannot therefore be broken. New Jersey has offered exceptionally favorable terms to corporations that incorporate under her laws and other states have joined in this offer of favorable terms, with the result that proper provisions for control have not been inserted. It is partly as a result of these mistakes of the state governments, and also because of their inability to agree upon a single line of action toward corporations, that the Federal government has been obliged to take action in regulating great business corporations or "trusts." Practically all great trading corporations deal in interstate commerce, and Congress has control over such commerce, and thus indirectly over such corporations. It has also been proposed that all corporations that have interstate commerce be required to receive incorporation from the Federal government, but so far this has not been done. (*See* Trusts.)

COR'SICA. This island possession of France, acquired just the year before the birth there of Corsica's most famous son, Napoleon Bonaparte, is noted for its "vendettas," or blood-feuds. For the haughty Corsicans, simple, sober, and dignified as they are on most occasions, still show themselves passionate and revengeful when their enmity is aroused, and the primitive practice of private warfare to avenge an injury has not yet died out.

Corsica lies in the Mediterranean Sea, about 100 miles southeast of France. It is due south of Genoa, and is separated from the island of Sardinia on the south by the Strait of Bonifacio. It has an area of 3,367 square miles; its extreme length is 110 miles, and its breadth 53 miles.

The surface is mountainous, with two snowy summits over 8,600 feet high. There are extensive forests of pines, evergreen oaks, cork-trees, beeches, and chestnuts. Although the soil is fertile, agriculture is backward, and scarcely enough grain is produced for home consumption. Chestnuts are ground into flour and form the chief food of many of the poorer inhabitants. Olives, grapes, oranges, and lemons are grown abundantly, and these, together with wine, oil, and fish, are the chief exports. The coral fisheries are also important. The mineral wealth consists chiefly of fine granite, porphyry, and marble.

Corsica was first colonized by the Phoenicians in ancient times; it was acquired by the Romans, who gave it its present name, and was for periods held by the Vandals, Goths, Franks, Saracens, Pisans, and Genoese. France purchased the island in 1768 from Genoa. During the wars of the French Revolution and Napoleon, Corsica came for a time under British rule. It was regained by the French, in 1815, and since then has formed a department of France. The language of the people, however, is mainly Italian. The capital is Ajaccio, on the west coast; the largest city (25,000 inhabitants), Bastia, is on the northeast coast. Population, about 300,000.

CORTEZ (*kôr'tĕz*), **HERNANDO** (1485–1547). In the same year (1519) that Magellan sailed from Spain on his great voyage around the world, a Spanish expedition led by Hernando Cortez left Cuba to conquer Mexico. In the 27 years that had gone by since Columbus first discovered the New World, this was the only region which promised the fabulous riches which that explorer had vainly sought.

This military adventurer, who set out to win fame and fortune, was the son of a poor Spanish nobleman who had won distinction by his exploits in Santo Domingo and in Cuba. He had no sooner got ready his expedition of 11 ships and 600 horses than the governor of Cuba repented of the appointment and sent word to Cortez to give up the leadership of the expedition. But Cortez, paying no attention to the order, proceeded on his way and landed in Mexico in March 1519.

Cortez was an extraordinary man, courageous, persevering, and resourceful. In order to prevent the desertion of his men, he sank his ships when he landed, so that all must fight or perish. He was aided in his conquest by a Spaniard who had been wrecked on the shores of Mexico several years before, and who had gained a knowledge of some of the Mexican languages. He was also helped by a beautiful Mexican princess, who was given to him by one of the chieftains as a slave and whose love he had won.

Cortez and the Legend of the Fair God

More valuable than either of these aids was the support lent to Cortez by an old Mexican tradition. According to it a fair-skinned god had once ruled over the land, but he had been driven eastward by a cruel bloodthirsty deity who demanded human sacrifices. The Mexicans for a long time had looked for the return of this Fair God, and when they learned that white strangers had come "in towers which moved hither and thither upon the sea," they thought it was their gracious deity, and they flocked to do him homage.

Not until Cortez had laid the foundations of Vera Cruz and marched two-thirds of the distance to the capital, Mexico City, did any of the natives appear to doubt his divine origin. Then a large army decided to test whether he really were a god. The decision was in favor of Cortez, for his little army of about 500 men, mounted on "frightful beasts" (horses) and using "weapons that shot forth fire and made a loud noise" (guns), defeated a force of 50,000 men armed with bows and wooden swords.

These natives then became the firm allies of the Spaniards and joined them in their march upon the Aztecs who ruled Mexico. About 70 miles from Mexico City the Aztecs planned a treacherous attack upon Cortez, but he was warned in time by his Mexican princess and disastrously defeated them.

Soon the fairy-like city of Mexico appeared in sight, situated on an island in a little lake and connected with the mainland by three great stone causeways or bridges. Montezuma, the emperor, offered no resistance, and in November 1519 the Spaniards entered his capital. To guard against sudden attack, Cortez kept the king as his prisoner and guest.

Meantime other dangers were threatening the success of the expedition. The governor of Cuba, angered by Cortez' disobedience of his commands and jealous of that leader's successes, dispatched an army of 1,200 men in 18 ships to recall him to Cuba. Cortez, however, persuaded these men to join him, and thus added to his army reinforcements which proved of inestimable value the next summer.

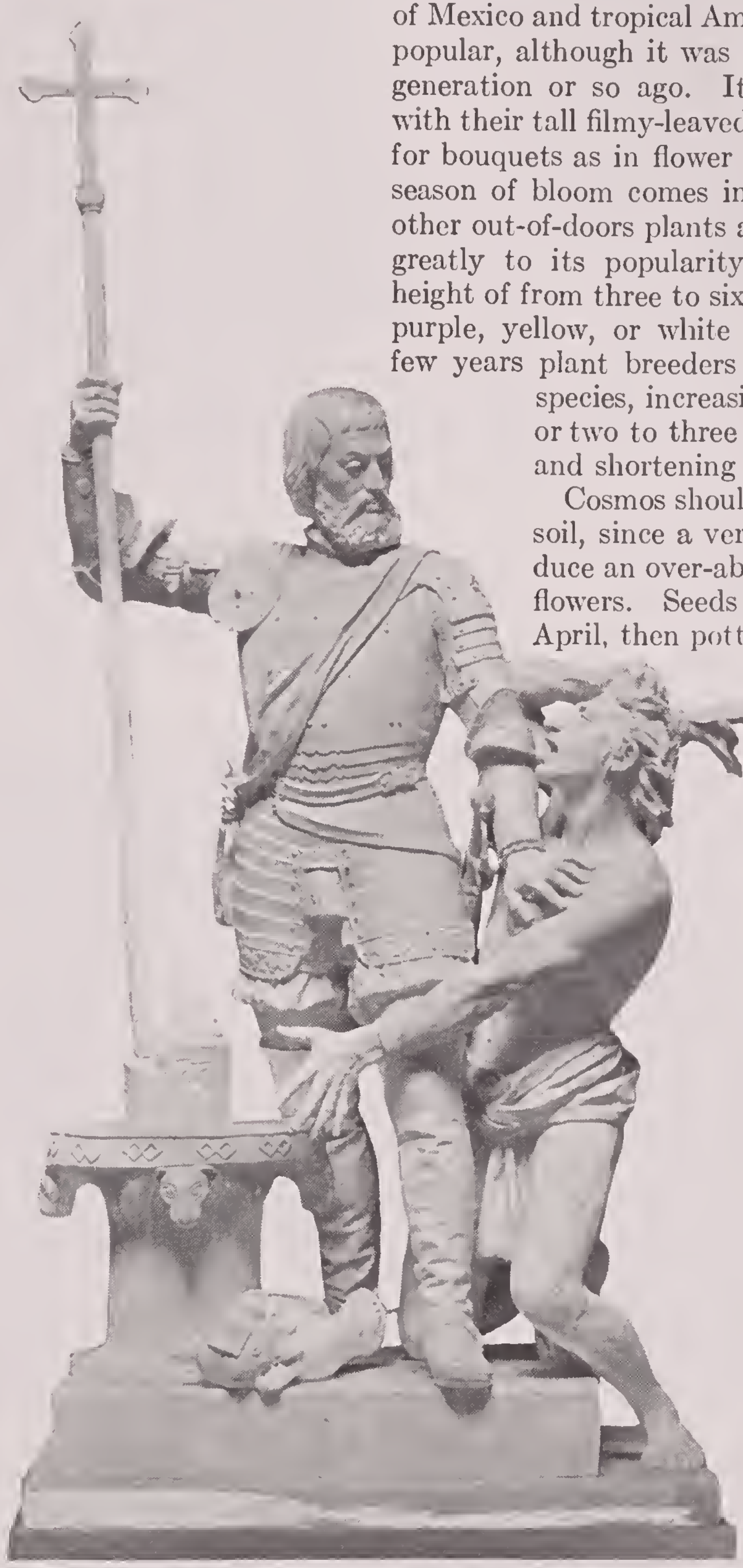
At that time the Aztecs rose against their emperor, Montezuma, deposed him, and elected a new ruler in his place. Then they attacked the Spaniards from housetops and from towers. In a terrible night retreat from the city, Cortez lost more than two-thirds of his men, but he did not give up. After reorganizing his army and building boats, he laid siege to the island city. The Aztecs fought desperately, but in August their city fell, and Spanish dominion was secure.

In the meantime Cortez' enemies, jealous of his fame as a conqueror and envious of the wealth of gold, silver, and precious stones he had taken from Montezuma, were plotting his ruin in Spain. In order to protect himself Cortez returned home in 1528. He was received with great honor by the king, Charles V, but when he returned to Mexico he went merely as a military commander, while another was appointed to govern the province he had won.

The governor constantly hindered Cortez in his expeditions, one of which led to the discovery of Lower California in 1533. Finally, embittered by quarrels and by loss of property, Cortez again returned to Spain. This time the king refused to receive him, and although Cortez rendered Charles V valuable aid on an expedition against Algiers, he was not restored to royal favor.

One day, according to a story, Cortez forced his way through a crowd to speak to the king. But Charles coldly inquired who he was. "I am a man," replied Cortez, "who has gained you more provinces than your father left you towns." The reply gained nothing from the king, and Cortez spent the remainder of his life in bitter neglect. Even later generations refused him justice, for he was long remembered for his cruelty, but his bravery and ability were forgotten.

CORTEZ AND THE CROSS



The best of the Spaniards held that the spread of Christianity was as important as conquest of lands. This spirit is typified in the statue of Cortez planting the cross upon an Aztec altar.

COSMOS. Each year the graceful cosmos, a native of Mexico and tropical America, becomes increasingly popular, although it was unknown to our gardens a generation or so ago. Its bright aster-like flowers with their tall filmy-leaved stems are as much desired for bouquets as in flower beds; and the fact that its season of bloom comes in the fall, when almost all other out-of-doors plants are through blooming, adds greatly to its popularity. The plants grow to a height of from three to six or even ten feet, with red, purple, yellow, or white flowers. Within the past few years plant breeders have much improved the species, increasing the flower from an inch or two to three or even four inches across, and shortening the plant stem.

Cosmos should be grown in rather sandy soil, since a very rich loam tends to produce an over-abundance of foliage and few flowers. Seeds should be sown indoors in April, then potted, and transplanted when the frost time is definitely passed. Unless so treated they do not flower early.

Cosmos bipinnatus and *cosmos sulphureus* (yellow) are the species best known. Black cosmos is a tender annual growing only 12 to 16 inches high. Cosmos belongs to the natural order *Compositae.*

COS'SACKS. "The Cossacks! The Cossacks!" On countless occasions in the days of absolute rule in Russia, these words were the signal for a mad scramble of the rioting people as the green-uniformed lance-bearing soldiers of the czars, mounted on shaggy ponies, swept down the streets, sabering right and left or firing into the crowds. Their reputation for savage ruthlessness was equaled only by their renown for endurance and horsemanship.

These hardy cavalrymen—the best in the world—came from communities which correspond to the early "frontier" settlement of the United States. Their adventurous ancestors in the 16th century had settled in the illimitable steppes of southeastern

Europe, which stretch from the Dnieper River to the Ural Mountains. There a mixed "backwoods" population grew up, composed of Russian, Polish, and Tatar elements, and distinguished by the fact that its members were free men and not serfs, and by their unsettled modes of life. With a persistence and endurance lacking in the ordinary Russian peasants, they played a notable part in the exploration and colonization of the vast expanses of Siberia. One of their "hetmans" or leaders was the famous Mazeppa who with 80,000 Cossacks aided Charles XII of Sweden against Peter the Great in the battle of Poltava (1709). His story is the subject of a famous poem by Byron.

Under Russian rule the Cossacks were treated as military communities possessed of special privileges, such as tax exemption and self-government. In return, the men trained as soldiers from the age of 18 to 38, and served as light cavalrymen in the czar's armies. They numbered about 3,000,000 and lived a very democratic life. They still form two chief groups—those of the Dnieper River, where they were called "Little Russian Cossacks" or "Cossacks of the Ukraine," and those of the Don River, where they were called "the Don Cossacks." The success of the Russian Revolution which overthrew the czar in 1917 was in part due to the refusal of the Cossack soldiers to fire upon the people.

COSTA RICA (*kŏs'tȧ rē'kȧ*). Columbus himself in 1502 discovered this small country of Central America. His opinion of its charm and value is shown by the name he gave it—"Rich Coast." Like the other republics of Central America, it is a region of great forest and mineral wealth, but it is also a country of volcanoes and earthquakes, with a large area of uninhabitable lowlands.

Nearly all the people live on a cool and fertile plateau in the central part, about 3,500 feet above sea level. Here the population is very dense. From Mt. Irazú, near Cartago, can be seen countless small farms, little villages gleaming in the clear sunlight, and on almost every hill the bungalow-like residence of a coffee planter, nestling amid luxuriant foliage. From the summit of this volcano, which is almost two miles high, can be seen also the great virgin forests over which float the mists of tropical jungles, while beyond are the far-off lines of the sparkling ocean.

On this plateau has grown up a nation different from any of the other Central American republics. The people have a large percentage of Spanish blood, and are industrious and sturdily independent. The Indian population is relatively small and unimportant. Most of the peasants own their own farms, can read and write, and it is a proud boast of Costa Ricans that they employ more school teachers than soldiers. The country has suffered little from civil wars or the troubles of its neighbors. The capital, San José, with its one-story red-brick houses, is a quiet, neat little town, well paved and lighted. It is now connected with both coasts by a railway which goes from Puntarenas on the Pacific to Limon on the Caribbean.

Costa Rica is the greatest banana land in the world. In one year 11,000,000 bunches are exported—enough to provide a dozen bananas for every person in the United States. Next to bananas, coffee is the most important crop of the country, chiefly the excellent quality from the small plateau around San José. With the exception of gold mines, the mineral wealth of the country is little developed.

Costa Rica's history shows the usual ups and downs of a Central American state. After centuries of mismanagement under Spanish rule, it joined in the general revolt of the colonies from Spain in 1821, and for a time was united with Mexico. It twice joined with the other Central American states to form a federal union (once from 1824 to 1848 and again from 1897 to 1898), but neither attempt achieved much success. In 1856 Costa Rica was conquered by an American adventurer, William Walker, whose filibustering expedition to Nicaragua was part of a scheme to add new territory for slavery to the United States. The republic has had the usual experience with dictators and boundary disputes with its neighbors, in which the United States at times has intervened. Population, about 400,000.

THE OX TEAMS OF COSTA RICA

Because of the bad roads, oxen drawing carts with solid wooden wheels take the place of horses. Here is a plantation "caravan" setting out to market.

The PAGEANT *of* DRESS *through Fifty Centuries*

The Curious and Interesting History of Styles, from the Early Egyptian Loin-Cloth to the Modes of Today

COSTUME. With the spread of modern civilization, special national costumes are practically disappearing. Ready-made clothing puts man and master, maid and mistress, in the same style if not in the same fabrics. Humdrum overalls are replacing the picturesque cantonal dress of Switzerland, and the quaint Dutch national dress is rarely seen except in places where it is worn to attract tourists. Even in China and Japan, especially in the seaports, the more convenient and prosaic dress of the western countries is being adopted. The kilt of the Highland Scots has practically disappeared except as the national court dress and the uniform of the Highland regiments of the British army. The old national dress of southern Albania is similarly preserved in the uniforms of the Greek army; it, too, is a kilted affair, with flowing white sleeves, a sleeveless embroidered jacket, and a broad sash.

Thanks to the torrid climate, "cool and simple" was the rule in old Egypt.

Greek and Roman Costume

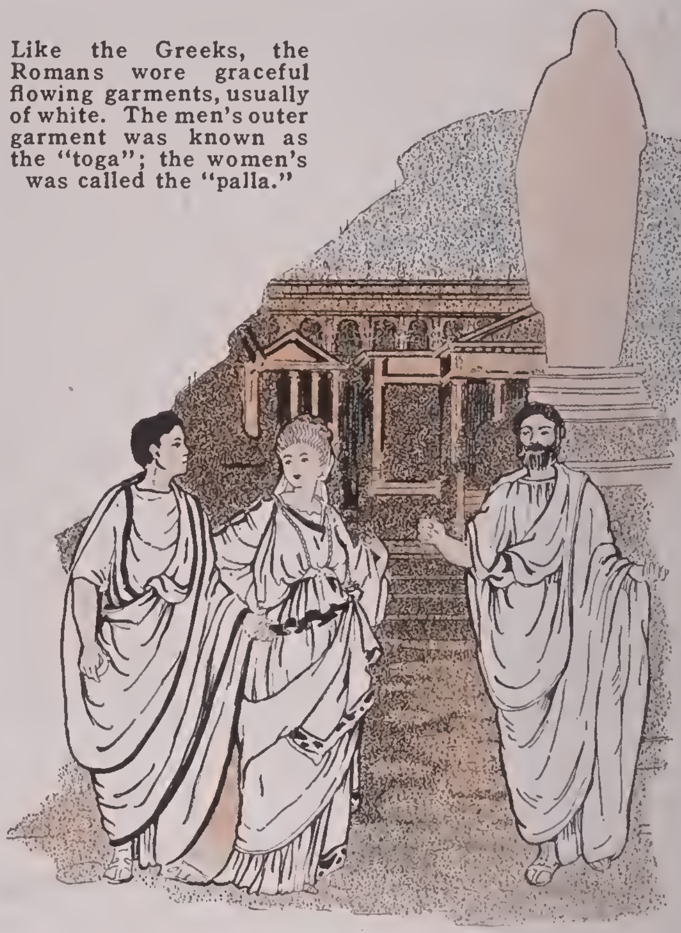
The development of costume was influenced largely by the desire to make the dress tell something of the position or rank of the wearer. In early Egypt and Babylonia, kings, priests, and other officers were distinguished by the vestments they wore over the ordinary apron or loincloth, which later developed into a long skirt. The draped costume reached its highest development in the dress of Greece and Rome. The garments were chiefly pieces of cloth hung in elaborate folds and fastened with girdles and brooches. The principal garment of Greece was a long sleeveless tunic of light texture (called "chiton") worn next to the skin. Over this was draped the "peplos"—a square piece of woolen cloth about a foot longer than the height of the wearer. The upper quarter was folded down, and the whole garment was then doubled and wrapped about the body, and fastened over the shoulders with brooches (called in Latin *fibulae*) of the type of our modern safety pins. This remained the dress of women, especially in the Doric states. The peplos was usually worn girdled about the waist, and in Athens it was customary to sew up the right side from below the arm. Men wore also the "himation," a square of woolen stuff similar to the peplos but draped across the chest and over one arm; and women wore the himation in different colors as an overgarment. A lighter garment was the "chlamys," a short mantle worn by young men.

The "toga" was the national dress of Roman citizens, and was always worn outdoors, except when at work. It was a great circular piece of woolen material and corresponded, but for the difference in cut, to the Greek himation. The women wore a long tunic ("stola") with a border of darker color along the lower edge. Over this was draped a garment called a "palla," arranged in many graceful ways, according to the whim of the wearer. The toga worn by lads under 16 years of age—and also by certain officials—had a border of purple and was known as the *toga praetexta*. For special occasions, such as a general celebrating a triumph, a purple toga with embroidery was worn over a gold embroidered tunic and this became the "purple" of the emperor.

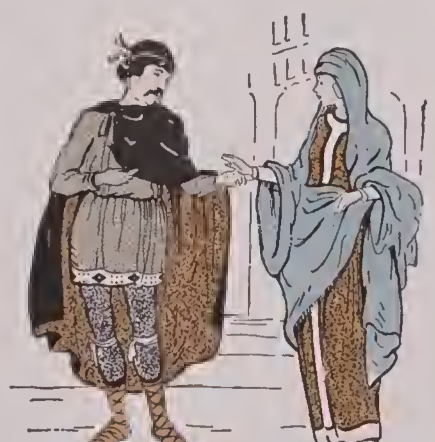
Origin of the Dress of Today

Men's clothing of today can be traced pretty plainly back to the 17th century. The long trailing garments of the Middle Ages, with sleeves so long that they had to be knotted up to keep them from dragging in the mud, had passed; and so had the puffs and slashes and trunk hose, and the grotesque parti-colored clothing of Elizabethan days, which, viewed from one side, seemed to be a costume of red and white, perhaps, and from the other side, green and yellow. The doublet, the ancestor of the coat, had gradually become longer, and had buttons and buttonholes reaching its entire length, and the long loose sleeveless waistcoat showed beneath. The great petticoat breeches of the early 17th century became smaller and were fastened below the knee. Instead of the ruffs and lace collars of the earlier day, broad but plain linen collars were now worn.

In ancient Crete the women's costumes were strikingly like some 19th century European modes.

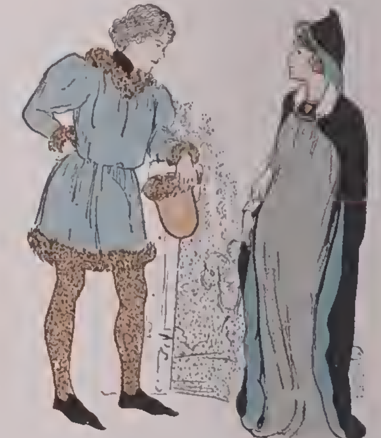

Like the Greeks, the Romans wore graceful flowing garments, usually of white. The men's outer garment was known as the "toga"; the women's was called the "palla."

For convenience in riding horseback, the ordinary method of conveyance then, the skirts of the long coat were turned back and buttoned in the small of the back, and men's frock coats still retain these (now useless) buttons. The tops of these early coats were cut so they could be fastened up around the neck, and the V-shaped nick which is in all modern coats is a survival of this custom. Gradually the coats were shortened and cut away in front. The modern evening dress represents a further such cutting away of material. When the "swallow-tail" coat was first worn, the tails reached the ground.


Frankish modes in the time of Charlemagne.

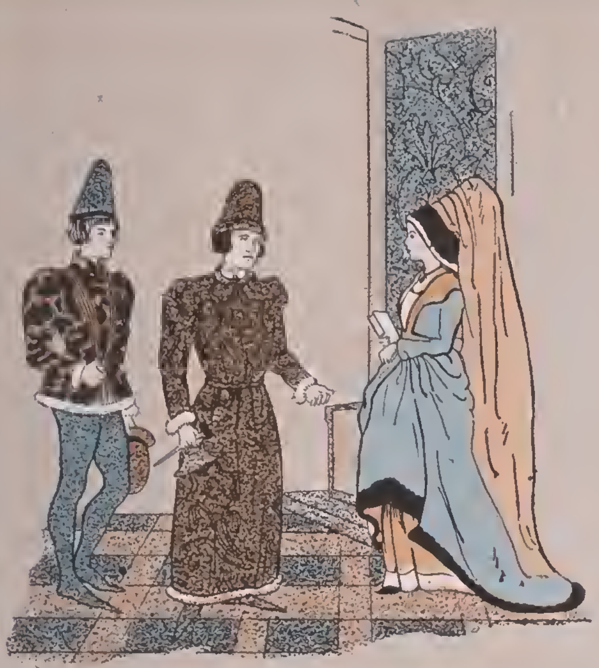
Lovers of beauty in all things, the ancient Greeks achieved perhaps the most graceful costumes known.

Wigs of various kinds have been in use since very early times. Queen Elizabeth had more than 80 wigs of different colored hair, and more than 3,000 gowns of strange fashion. As an indispensable article of gentlemen's dress the wig began in the middle of the 17th century with Charles II. The heyday of the wig came in the 18th century. The shapes it assumed were innumerable. There were wigs for clergymen and for doctors; the man of law wore a huge tie peruke, and the army and navy a great cluster of temple curls with a pigtail behind. The fashion of powdering the hair came in from France and continued through a considerable period. The wig is still worn in the English law courts and by the speaker of the House of Commons. Washington, as we know him from his pictures, wore a powdered wig.

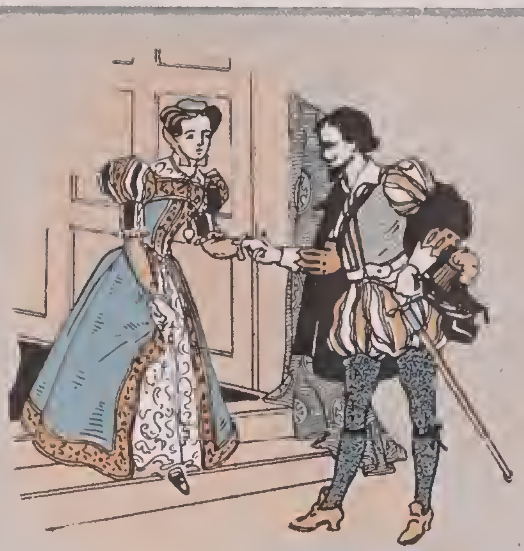

In the early 15th century men in western Europe fancied puffed sleeves and pointed shoes.

About this time—1770—the high headdresses for women came in and found their extreme examples in

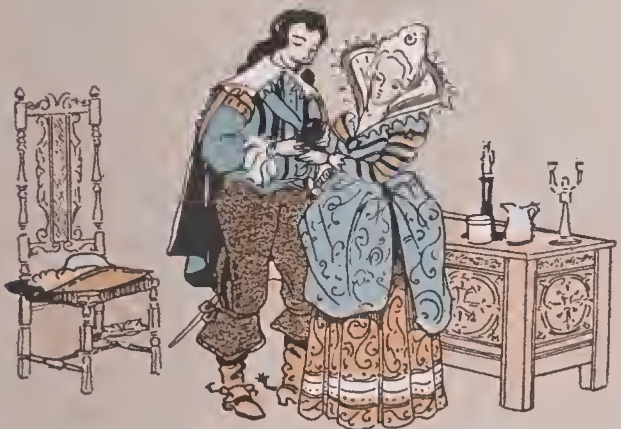
SOME QUEER COSTUMES IN TIME'S FASHION PARADE



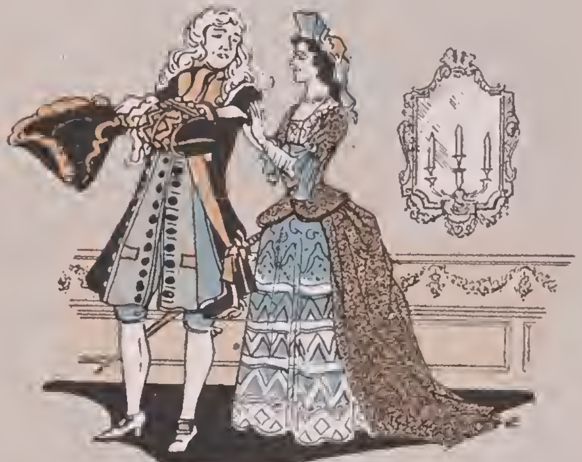
Burgundy—Late 15th Century



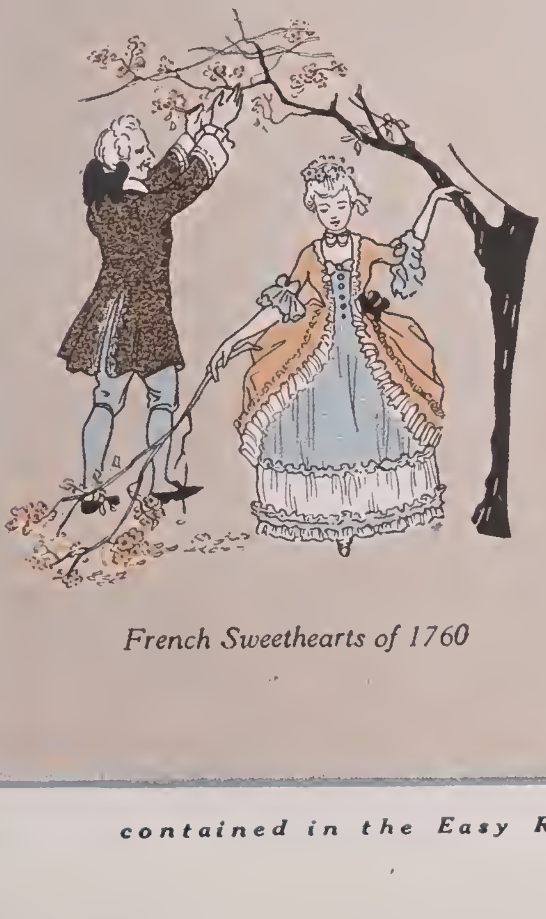
German—Late 16th Century
(Showing Spanish Influence)



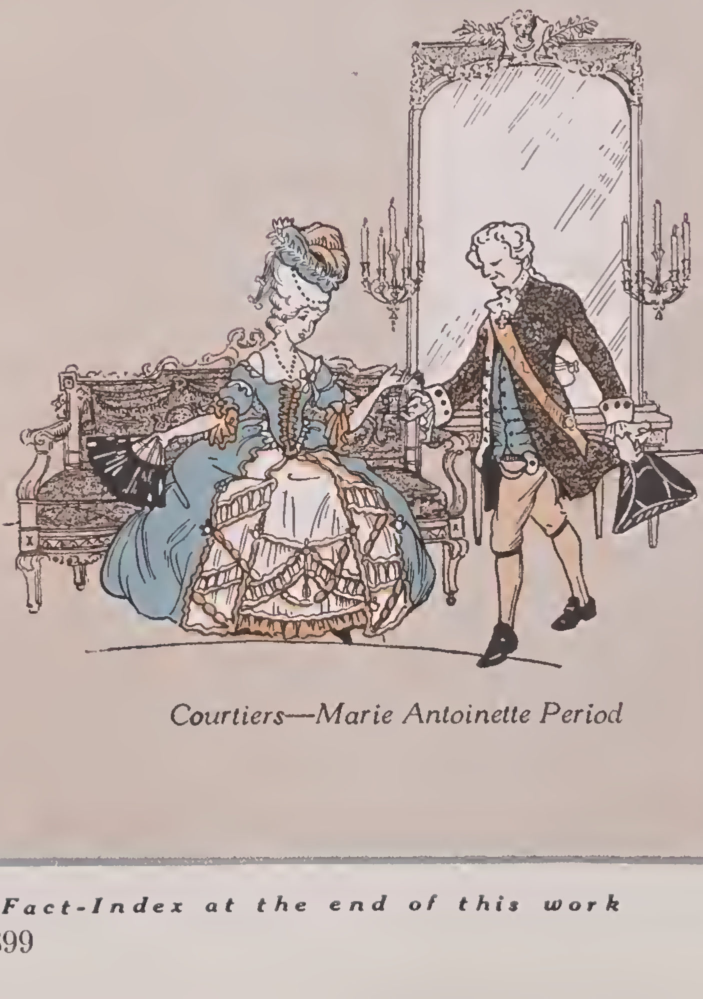
French—Early 17th Century



Dame and "Elegant" of 1695



French Sweethearts of 1760



Courtiers—Marie Antoinette Period

London fashionables in the dawn of the 19th century. The two on the right have the "latest style from Paris" and feel correspondingly superior.

France. The bodies of these enormous structures were formed of tow, over which the hair, perfumed and kneaded with pomade, was drawn in curls and rolls. The whole was freely plastered with powder, and decorated with great bows, ribbons, feathers, and flowers. Sometimes these enormous structures were surmounted by a representation of a ship in full sail, or a miniature garden, and some were so high that it was not possible to enter an ordinary door without stooping.

During the French Revolution the three-cornered hat, the powdered wig, the pigtail, and knee breeches all began to go out of style and simpler fashions gradually became settled. Long trousers were first worn by the "breechesless" (*sans culotte*) rabble of the Revolution, but they soon became a part of the conventional men's dress of today. Knee breeches, however, are still worn in English court-dress and for sports wear.

Long tight trousers were the style of the early 19th century, and the dandy wore doe-skin trousers and a coat of blue, claret, buff, or brown, thrown back to reveal the waistcoat. Until near the close of the 19th century it was not fashionable to have the trousers creased, for this was the mark of store (ready-made) clothes that had lain folded on a shelf—the "hand-me-downs." With the rise of the high hat (beaver, later silk) in the 1830's, the last phase of men's fashionable costume was entered. Later styles have been modifications of the ideas launched during this period.

When our great-grandparents went walking, about the time of the Civil War, the hoop skirt for women and tight trousers and tall hats for men were all the rage.

The great starched ruff and the farthingale are the outstanding characteristics of women's costume in the days of Queen Elizabeth. These ruffs, stiffened with wires and spread over concealed frames, became so enormous that it looked as if the head were being carried on a huge platter. The skirts became extended until they stood out at right angles to the body. This was the first appearance of that curious thing, the "hoop skirt" or "farthingale," as it was called at that time. Its next appearance was in the 18th century, when a tight-fitted bodice, often sleeveless, surmounted great billowing petticoats, and over these hoop skirts the gown was draped and looped like a drawn curtain. In 1750 the hoop petticoat had attained such proportions that ladies found it difficult to pass each other in the narrow streets of London and Paris. The last wave of the extended skirt or "crinoline" came in the 19th century. It was at its height in the United States in Civil War times, and echoes of it continued in the bustle and hip-pads even into the beginning of the present century. Since the draped and kilted princess robe which followed the crinoline hoop skirt, women have had more individual freedom in their clothing, although the fashions are changed slightly from year to year by the modistes for stimulation of trade.

The distinction has been made that near the Equator both men and women wear some modification of the skirt, while in the more strenuous life of the Arctics, both men and

How quickly styles get out of date! The "leg of mutton" sleeves and voluminous skirts of a generation ago seem almost as strange to us as those of half a century earlier.

women wear trousers. In the great temperate zones the men have kept the trousers and the women the skirts. An exception to this is the trousers of the women of China and the long full bloomers worn by Mohammedan women. The freedom of action possible when trousers are worn has led to their adoption by women engaged in hard work, as in the mines in Belgium, in tending cattle in the Tyrol, Switzerland, and in many industrial plants in Europe and America as well. Women have also adopted breeches for riding, golfing, and other sports. (*See* Hats and Caps; Shoes.)

The LITTLE QUEEN *of the* COTTON FIELDS *and Her Wonderful Gifts to the World*

Cotton Boat on the Mississippi River with a Full Load of Bales

"AWAY down south in the land of cotton," we sing to the rollicking tune of 'Dixie'. And "Dixie Land" is the land of cotton, for if we draw a line from the mouth of the James River at Norfolk, Va., west through Cairo, Ill., to Oklahoma City, and south through central Texas to the Gulf, we have inclosed the region where three-fifths of the world's cotton is grown. It is the most widely useful of all our fibers. From it we make most of our clothing—more than we get from all the wool and silk and linen put together. It is used in making the films on which our motion pictures are photographed. It goes to the making of some of our most powerful explosives. And besides scores of other uses for the fiber, the seed gives us oil and one of the most valuable of cattle feeds. Millions of people—enough to make a city the size of New York—are employed in the United States alone in the industries that depend on this useful plant.

COTTON. The soft fleecy fiber that makes cotton one of the most useful of the world's plants is the fluffy coat that Mother Nature has put around the cotton seeds, so that when they are ripe they will be caught up by the winds and sail far and wide like thistledown. This downy fiber is what men gather, clean, and spin into threads to make our clothing.

A great field of cotton plants, each hung with its balls of fleece, dazzlingly white in the sunshine, is one of the prettiest sights in the world. Each plant is a dainty little bush, about four feet tall, very clean and bright, and very particular that the ground under its feet be soft and warm and have no common weeds in it. It wants to stand all alone, with two or three feet of room to spread its green satin skirts.

The cotton blossom has several gowns to wear. For its coming-out party it has a snow-white silk petticoat. The papers always mention it, saying: "Cotton is in blossom and looks well." It soon gets tired of its coming-out gown and changes it for one of shell pink, then for a rose pink, for the blossom does not fade as other flowers do. At last it turns red and the petals fall, revealing a capsule like a hazelnut filled with little seeds. These capsules are called cotton bolls.

For six or eight weeks the cotton bolls swell until they are as big as eggs. The husk turns brown and cracks along five seams. Then it bursts wide, and out pops a fluffy snowball. The cotton does not ripen all at once like wheat, and sometimes you may see pink and white blossoms, green pods, and big snowy bolls all in one field. The picking season lasts from July to Thanksgiving, and a field must be picked over and over. This leisurely work in the warm bright autumn days of the South just suits the sun-loving, happy-hearted negroes. As soon as the first bolls burst open, they swarm into the fields by thousands, moving from one plantation to another. They live in camps and make a kind of picnic of it. At night they dance and sing and play the banjo.

IN PICKING TIME

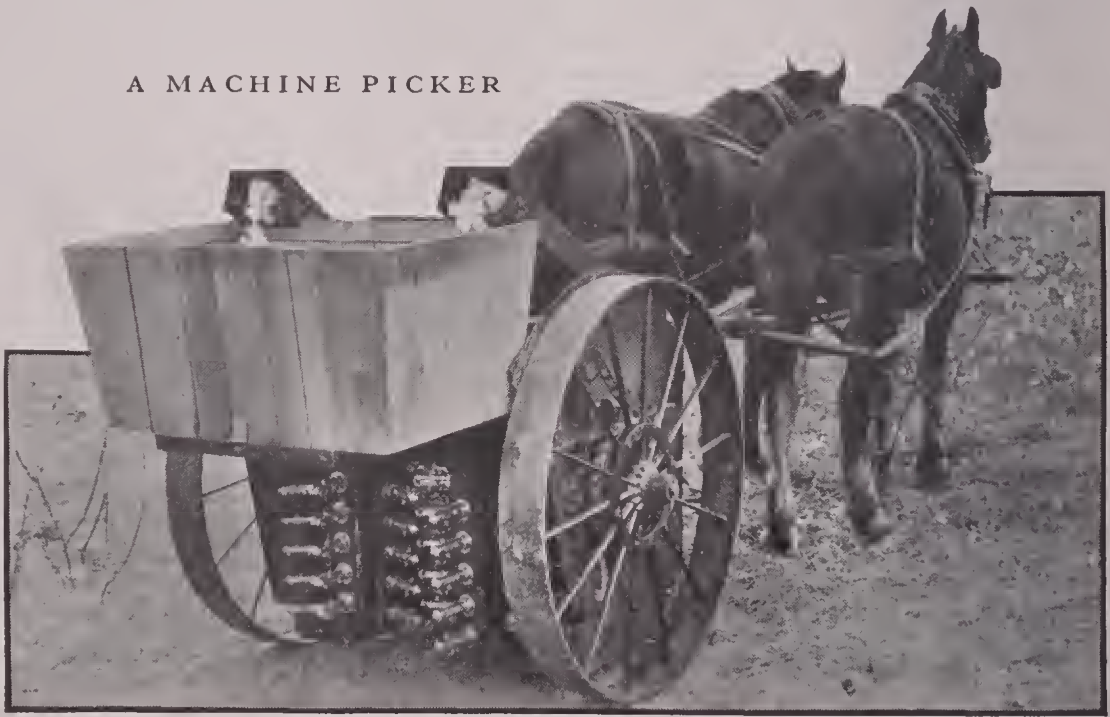
Negroes are the best cotton pickers, for they do not mind the burning sun. It is also a kind of work the "pickaninnies" can do.

A ripe cotton boll looks like a soft mass of snowy lint. But if you squeeze it you can feel little hard lumps inside. Pull the fuzzy hairs apart. They cling tight to dark brown seeds about as big as orange pits and mat like felt about them. It would take you several minutes to pull the seeds from one boll, and a day to save a pound of cotton lint.

Up to the end of the 18th century all the cotton seeds had to be pulled from the lint by human fingers. That made cotton cost a great deal, even when the work was done by slaves. Then an American invented a machine with rows and rows of little steel fingers. The fingers were set on a sort of rolling pin turned with a crank like a clothes wringer. This machine is the cotton gin. The gin of today is a greatly improved machine, and is run by steam; but it works on the same principle as the one invented by Eli Whitney.

The pickers in the fields carry big brown bags or baskets that will hold many pounds of bolls. As soon as they have gathered a wagon-load, a man drives it to a ginning factory, which is generally near a railway station. The cotton is weighed and dumped into a big hopper outside. Before you can wink twice the whole wagon-load is sucked up through a big pipe and disappears as if a giant had swallowed it.

A MACHINE PICKER



This ingenious device travels down the cotton rows. The short rods beneath the body revolve past each other, combing out the cotton bolls which are then carried upward and dumped into the box.

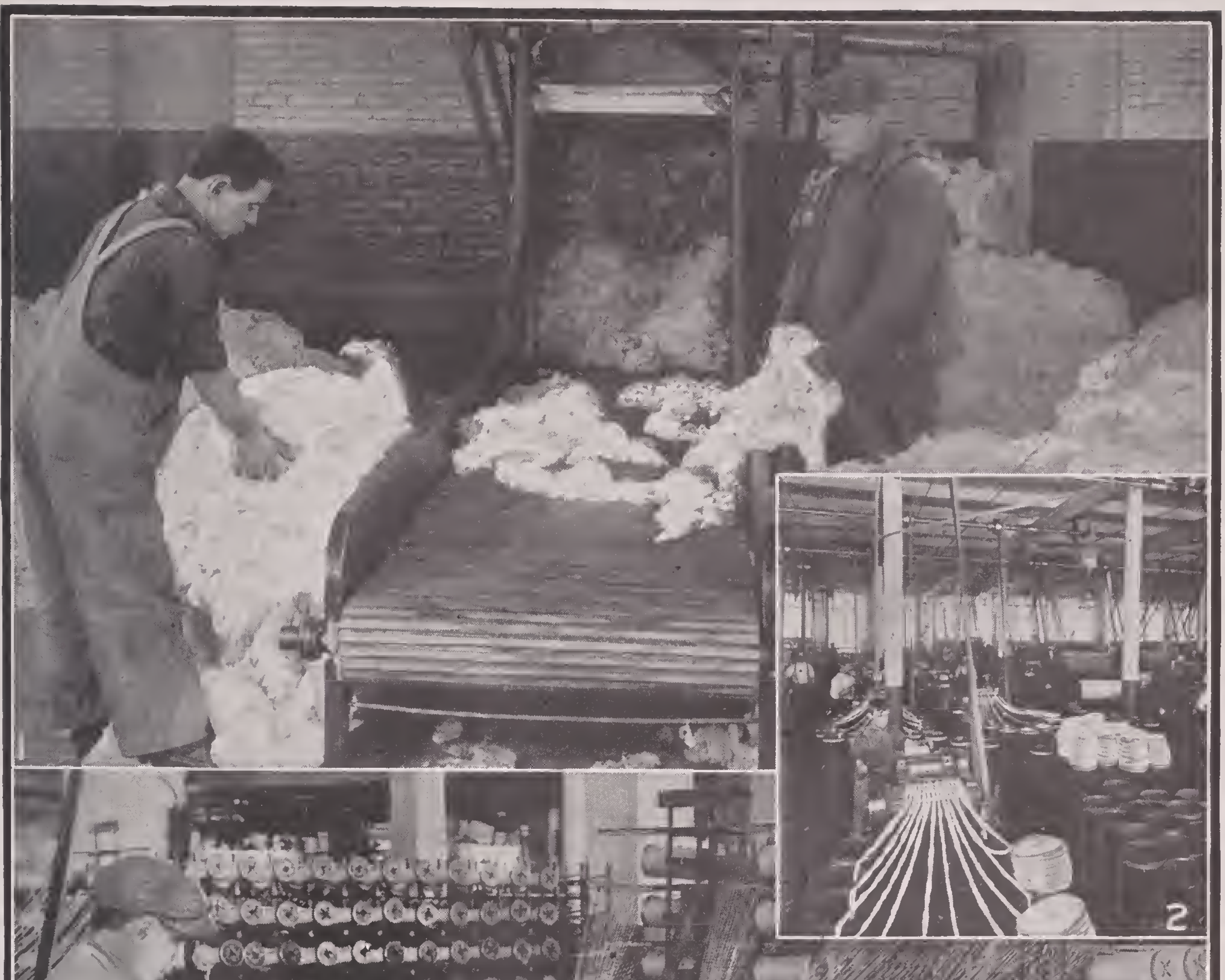
Inside there is a dreadful chugging and clattering. Everywhere are whirling wheels and flying belts, and big soft drifts of cotton lint which have been torn from the seeds by the little steel fingers. The cotton is brushed from the teeth by brushes, and the seeds drop through into the tanks below.

The seeds used to be thrown away or burned. But it was discovered that these seeds are as full of oil as nuts, and that this oil has a pleasant taste. So now the oil is squeezed out and used for salad oil on the table and for cooking, and to make oleomargarine. The crushed seeds, with or without the hulls, are pressed into cakes and sold as oil cake or cottonseed meal—one of the richest of foods for cattle.

When the cotton lint is torn from the seeds it is as soft and light as swan's-down. So it is pressed into bales weighing about 450 pounds, each bale is wrapped in brown bagging and bound with iron bands, and then it is ready to be shipped away to the mills to be spun and woven into cloth. Some of it will go to mills in the Southern states, more will go to the larger, older mills in the Northern states, and a great deal will travel a long, long way to England—which uses about one-half of all the cotton grown in the world—or to France, or even to Japan.

In the mill the bales are opened and the crowded lint is loosened, beaten to a swan's-down fluff again, and fanned free of dust. One bale fills a big room, it is so light. The tiny hairlike fibers lie twisted and tangled together. They have to be combed, and

TURNING COTTON INTO CLOTH



These pictures show glimpses of the three chief operations in making cotton cloth—carding, spinning, and weaving. At the mills the cotton is first fed into machines (1) which loosen the fibers. A strong suction draft carries away any dirt that is mixed with it. After the fibers have been combed out, the cotton is formed into a soft ribbon called "card sliver" and coiled into cans. In the next picture (2) we see fourteen strands of "card sliver" passing into the "drawing frames," where they are drawn out and twisted over and over again in the process of spinning. In the lower picture, you see the cotton, after it has been spun into yarn or thread, being wound up on the "warper frame," ready for the loom, which will weave in the cross threads.

made to lie all one way, just like your hair. To accomplish this, the fluff goes through roller combs set with thousands of little steel teeth, like a very fine wire brush. One row is laid straight, then another behind it, and another until a sheet is formed. The little fibers lie end to end, overlapping each other.

Next the fluff sheet is parted into narrow strips called "rovings" that pass through grooves in big steel rolls. Each strip is rolled over and over into a soft hollow rope as big as your two thumbs. This passes through smaller and smaller grooves. It is squeezed and twisted and pulled and rolled, in one machine after another, until it is a cord as big as twine, but still very soft. Another cord just like it is twisted with it to a fine yarn. All this rolling and twisting is called spinning. It makes a yarn ready for weaving. If you want to know how small this yarn is, ravel a piece of muslin and look at just one thread. That is cotton yarn. It would take six such strands of yarn twisted together to make fine sewing thread.

THE EVIL GENIUS OF THE COTTON FIELDS

This is a Cotton Boll Weevil puncturing a cotton boll with its long beak. It lays its eggs in the hole and when the young hatch they eat their way into the boll and ruin it. The beetle in the picture is very much magnified. In life, it is less than a quarter of an inch long, yet the damage it does is enormous.

How the Cotton Becomes Cloth

The spun yarn is wound on big bobbins or spools for weaving. Cloth is woven much as little children weave paper and splint mats in kindergarten. The threads run up and down, and across, over and under.

In a weaving loom the ends of the lengthwise threads (called *warp*) are fastened to a roller. These threads are so close together that they look like thin cloth. In weaving plain fabrics every other thread is lifted, and all at once, while the odd threads—the first, third, fifth, etc.—are lowered. A shuttle carries the filling thread (called *weft* or *woof*) between them. Then the upper threads go down and the lower ones up, and the shuttle flies back.

On one journey the shuttle lays its filling thread *under* the odd threads and *over* the even ones of the warp, and on the way back the filling thread is laid *over* the odd threads and *under* the even ones. The motions of the loom are very swift; sometimes the shuttle makes as many as 200 trips a minute across the warp threads. As the cloth is woven it is wound on a huge roll. In this way miles of cotton cloth are woven by great looms worked by steam power.

How much work has been done since the little cotton seeds were planted! And yet good cotton cloth is sold for a few cents a yard. A great deal of it is dyed, too, or it is printed in pretty calico patterns. Sometimes, as in dress ginghams, the yarn is dyed many colors before it is woven. Some looms weave satin-like stripes and dots and flowers on the cloth. A great variety of weaves may be obtained by varying the way the filling threads are interlaced with the warp. The common cotton materials are voile, organdie, batiste, gingham, percale, longcloth, nainsook, calico, piqué, cotton rep, cotton poplin, cotton velvet, and India "linen." Linen and silk and wool are spun and woven in much the same way, but these are not so cheap as cotton.

The "Tree Wool" of the Orient

History does not go back far enough to tell us of the time when fine fabrics for the rich and coarser stuffs for the poor were not produced in India and Egypt from cotton or "tree wool," as it used to be called. By the 11th century after Christ the "filmy muslins" of the East were brought regularly to Europe by the ships of Venice and Genoa.

The earliest explorers of the New World found certain species of cotton growing wild in the West Indies, and Cortez found the natives of Mexico highly skilled in spinning, weaving, and dyeing it. Ancient mummies have been found in Peru wrapped in coarse brown cotton cloth similar to the fabrics which the natives still manufacture.

Perhaps you think all cotton is alike. It isn't. There are as many kinds of cotton as there are of apples, but only four are commercially important—sea-island cotton, Egyptian cotton, Peruvian cotton, and American upland cotton. The important difference is in the length and texture of the fibers.

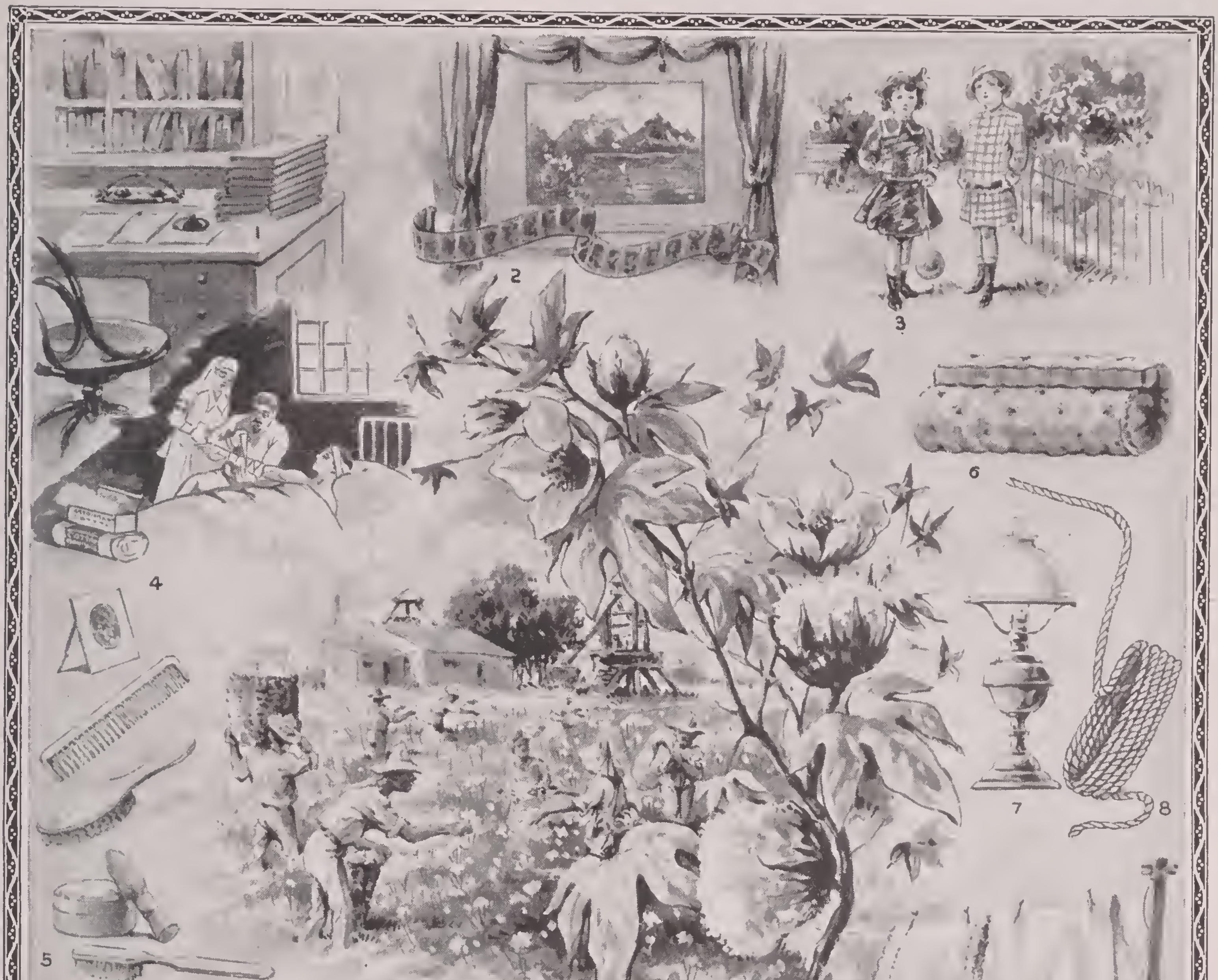
Sea-island cotton is the most valuable, for the fibers have an average length of 1.61 inches and can be spun into strong fine thread.

Delicate fabrics such as voile, velvet, laces, and the finer grades of spool cotton are made from it as well as fabrics in which great strength is necessary, such as airplane and balloon cloth, mail-bags, and tire fabrics. Sea-island cotton sometimes grows to a height of 12 feet or more. It takes its name from the fact that it was first grown in the West Indies and the islands off the coast of South Carolina. It is also cultivated in the coastal regions of Florida, Georgia, and South Carolina.

In *Egyptian cotton* the fibers are shorter and of a tawny color. It has fineness, elasticity, strength, and a great natural twist. It is used in the manufacture of Balbriggan underwear, of the better grades of hosiery, and for mixing with silk or wool. Since 1912 this cotton has been produced in California and Arizona, as well as in Egypt.

Peruvian cotton is brownish, rough, and hairy, and resembles wool. The seeds grow together in a kidney-shaped mass, and for this reason this cotton is sometimes called "kidney cotton." It is mixed with

NINETEEN THINGS COTTON HELPS MAKE



Cotton and the products of cotton enter into the manufacture of a great variety of things, some of which are shown here. Paper and Books (1); Movie Films (2); Clothes (3); Antiseptic Cotton and Bandaging Gauze (4); Celluloid Photograph Frames and Toilet Articles (5); Mattresses (6); Lamp Wicks (7); Rope and Twine (8); Soap (9); Foodstuffs (10, 11, and 12); Textiles and Thread (13 and 14); Waste for Wiping Machinery (15); Guncotton used in Explosives (16); Sails (17); Cattle Meal and Dog Cakes (18); and Fertilizer (19).

wool in making cloth and hats, and is also used in making underwear.

American upland cotton comprises about two-thirds of the world's cotton supply. Most of it has fibers less than an inch in length. Cottons with the shorter fibers mature earlier and yield a larger crop than those with longer fibers.

Cotton is a perennial where there is no frost, but under cultivation seeds are usually planted every year for fertilization purposes and to keep the insect and fungus pests in check.

Cotton has several dangerous enemies in the insect world, the boll weevil being the most deadly. This small beetle attacks the growing bolls and ruins the cotton before it is ripened (*see* Weevils). Another pest is the cotton caterpillar, which strips the plants of their leaves. A fungus growth known as wilt enters the roots of the plant through the soil, clogging the cells, and causing the plants to wilt and die.

There are many important products of the cotton plant besides cloth. The seeds, covered with soft short fuzz, are re-ginned and the product, known as "linters," is used in the manufacture of low-grade yarns, wrapping twine, cheap rope, lampwicks, mattresses, upholstering, and smokeless powder. "Cotton waste" is the underlengths and the broken fibers which accumulate around the gin. Some of the better qualities are used in the weaving of coarse cloths, but the great bulk goes into mattresses, cotton batting, cheap absorbent cotton, and explosives.

The stalks of the cotton plant as well as cottonseed meal are sometimes plowed into the soil as fertilizer. Of recent years pulp made from the woody stalk has been used not only for making an excellent grade of paper, but also for the manufacture of artificial silk, and in the making of various chemicals—pyroxylene, alcohol, and acetone (*see* Cellulose).

The cotton plant belongs to the Mallow family. The bolls vary from almost spherical to long narrow pointed capsules, and are divided into three, four, or five segments. Scientific name of sea-island cotton, *Gossipium barbadense;* of upland cotton, *Gossipium hirsutum.*

COUNTERFEITING. The crime of counterfeiting, which consists of making imitations of coins or paper money, has always been severely punished by civilized nations, for it strikes at the very foundation of a country's financial credit. In the Middle Ages counterfeiters were put to death. Today, heavy fines and long terms in prison are the rule.

The laws guarding against counterfeiting are especially severe in the United States. Many apparently innocent things are forbidden because they might suggest counterfeiting to persons with criminal tendencies. For instance, it is forbidden to take a photograph or publish a photograph of the face of any bill or coin, or to draw or paint a bill or coin on a public billboard. It is forbidden to make or have in your possession a metal plate engraved or etched with the likeness of any bill or coin, no matter now crude this likeness may be, or to make or have in your possession any of the special paper upon which United States currency is printed. Nor is it allowed to make or have in your possession any mold of any coin, so that even a small boy who takes the impression of a coin in a piece of clay is technically breaking the law. It is also against the law to mutilate or alter in any way the face of any coin or piece of paper money.

The most important law to know, however, is the one which forbids anyone to have a counterfeit coin or bill in his possession. If you receive one by mistake and can't remember who gave it to you, don't try to "pass it on" or keep it as a curiosity. Take it to the nearest postoffice and the United States secret service will look after the case. (*See* Money.)

COUNTY. To whom do you go to procure a marriage license or to have a will or a deed to a piece of real estate recorded? Who keeps your county roads and bridges in repair, cares for the poor who are not able to support themselves, and prosecutes men who disobey the state laws? In any part of the United States, outside of New England, probably all or most of these duties are performed by officers of the county; and even in New England, where many of them are taken care of by the towns, some are performed by county officials.

Your taxes are probably determined in large part by an elective county board known as the "Board of Supervisors" or "Board of Commissioners." This body also has charge of county buildings at the county seat (courthouse and jail) and of the county poorhouse, and it provides for the maintenance of roads and bridges. The taxes when collected are in most instances turned over to the county treasurer for safekeeping, and he pays them out upon order of the county auditor. Your marriage license is issued, or your will or land title recorded, by the county clerk. The sheriff of the county is the legal custodian of men arrested for most serious crimes, the prosecuting or state's attorney handles the cases, and the trials are held before the county or circuit judge. And a county coroner examines all cases of sudden death to determine whether the person died by accident, natural cause, or murder. All of these officers are usually elected by the voters of the county.

There are nearly 3,000 of these county divisions in the United States, varying in number in the state from 3 in Delaware to 243 in Texas. They range in size from the county of Bristol in Rhode Island, with an area of 25 square miles, to Custer County in Montana, which contains more than 20,000 square miles. The officers and their duties vary almost as much as do the size and number of the counties. In New England the county has little to do except to arrest and try criminals, but in the South almost all of the functions of local government are performed by this unit. In Louisiana, however, the corresponding district is given the name "parish."

The name "county" (Latin *comitatus*) was brought to the United States by the early English settlers. The Normans had introduced it into the country at the time of the Norman conquest, giving the name to the old Anglo-Saxon "shires" because of their likeness to the district ruled by a count in Normandy. The "county" in the United States is today a subordinate division created by the state, and its powers are defined by state law. It is created largely in order to place matters of local importance, such as roads, in the control of the locality concerned.

LITTLE TALKS ON GREAT THINGS

by Arthur Mee

COURAGE

We owe it to our race to be courageous. We live in the age of heroes. Men will talk of these days in the years to come as the age before which all others pale when one thinks of deathless deeds; and we owe to our country's flag what man will forever call "the spirit of the trenches."

It is the quiet courage of the lives of multitudes of people that makes a nation great. There are moments on the battle-field that a man feels he would die to live through, but the battle-field of war is not for most of us. For most of us there are the quieter battle-fields of *peace*, the courage of silent hours in solitary places, the bitterness that nobody knows, the suffering we endure alone. We must come to brave decisions with not a friend to help; we must bear the pain for which no doctor has the cure. The life we live within ourselves may have indeed its No Man's Land, and we "go over the top" when none other knows.

So we must steel ourselves for the stern needs of life. We must put on the whole armor of our being. We must grow up to be strong against temptation, quick to make a noble resolve, slow to anger, and patient in adversity. Life is hard at times for all of us, and only courage will pull us through. You have not felt heroic, perhaps; you do not remember that you ever did a golden deed; you never had to fight a fire, or save a child from drowning, or risk your own life, or stand as still as a stone while you suffered agony. But you have been brave. You have lived through moments of great courage, and you were not less heroic because you have forgotten it. True courage ever goes with modesty, and does not bother to remember.

One of the great English books is 'Tom Brown's Schooldays', and if you have read it you will never forget one thing. You will remember the new boy who came to school, and how at night, when all the merry lads and all the bullies were shouting and laughing and doing the things that all boys will, the new boy knelt down by his bed and said his prayers. You will remember the fun they made of him. It is easy to mock a lad when he is remembering his mother, but it is hard to do what Tom Brown did; for he, too, went to his bed and knelt down. There was courage in that, and it did not fail, for those who came to mock remained to pray.

There was a famous scene in the British House of Commons. The House was crowded and excited, for two heroic figures were in the center of the scene. One of the two was the Prime Minister, Sir Robert Peel; the other was a smaller man, who buzzed about him as a hateful fly will buzz about a splendid horse. There was nothing bad enough that the little man could say about the great man. To accuse him of assassination was not too bad, or of treachery; and as for the little man, he "would not stoop to serve under a minister like that." And when the little man had said these things the great man got up and made a great reply, but the courage of it was in the thing he did not say, for he never told the House, and it did not become known until long, long afterwards, that he had in his possession at that moment letters from the little man pleading for office under him. There was courage in that. It is a fine thing to be brave enough to let an attack go by, to care nothing for those who stab us in the dark, to go on with our work, whatever unjust things the world may say.

And then there was another man who may come into a talk about courage. He had been charged with a terrible crime of which he was innocent, but the proof of his innocence would have convicted another, who was guilty, and he did not try to prove it. He went to prison for many years. He lost his friends and reputation. The world became for him a living grave; and at last he came out of prison, an old and broken man who had given his life to save his friend. There is courage in that, the courage that quails before nothing, but will carry a man through whatever hazard there may come for him.

Courage and Self-Sacrifice

Like twin brothers are sacrifice and courage; not one can live without the other.

Did you read that story of the Salvation Army sailor in one of the naval battles of the World War? He was clinging with another to a piece of wreckage, that broke up till at last it could not support them both, and the Salvationist sailor said to his friend: "Good-bye. I will go. You are not ready to die, and I am." And as he spoke he slipped down into the sea.

Have you read of that old man in Japan who saw that a tidal wave was coming, and saw the people on the beach below him in great danger, but could not warn them? As quick as thought he set his rice-fields on fire to attract the people. Have you heard of those boys in a great school to whom a doctor went and said: "Two girls have been scalded in a laundry, and the only chance of saving their lives is to get some human skin to replace theirs. I want 150 boys who will give me a square inch of their skin. It hurts horribly, but without it the lives of these girls cannot be saved. What offers?" Up went 200 hands!

The Courage of the Soldier

It needs a great courage to forget ourselves. It is the courage of the soldier—the courage of that wounded man to whom a doctor said, "This is a bad business," and who replied, with a smile, "Yes, but we took the trench!" There was a lad who had a shrapnel bullet deep in his leg, and he begged that the doctor would take it out without chloroforming him, as he wanted to see it come out and take it home. There was an aviator who saw a machine-gun hidden in a field of grain, and the cavalry were coming on. He had only one means of warning them, and he used it. He came down and opened fire, and the machine-gun turned on him, but he saved the cavalry. There was a despatch rider who took a message through a curtain of fire in which it seemed no man could pass and live, but he delivered the message. "How did you get here?" asked the colonel; and all the man said was, "The despatch was marked urgent, sir."

Risking All for the Cause

It reminds us of those men who went down in one of the first crude submarines used in the American Civil War. It belonged to the South, and its submersion meant almost certain death for all the crew, but, knowing this, the crew went down and destroyed the ironclad.

And who that has ever read the story of the South African War will forget Private Goodman of Spion Kop? He had been on the hill all night, he had not had his clothes off for a week, and he came in, a hideous sight, after an eight hours' ride to the hospital. He could not speak, but he motioned for pencil and paper. They thought he would ask for a drink, or perhaps to send a message home, or perhaps it would be something about his pain; but what he wrote was, "Did we win?" Such courage had he, but there was none who dared to let him know the truth of the British disaster at Spion Kop.

What Courage Means to You

The strength to do such things is not in every man, but courage grows with the will to be brave. We must face life with confidence. We must believe that all is well; we must believe, with Socrates, that "to the good man no evil thing can happen." It will help us to endure whatever we have to face. It will save us from the folly of timidity, which spoils so many lives. It will make us unafraid of those who have a little power and use it harshly. We must seize our opportunities with eagerness and zeal; we must be willing to run the risk of taking chances. We must not turn back when we come to stony ground; we must not wince if life is not a bed of roses. Men have borne the heat of the day for us; men have suffered agony and died, that life for us might be enriched. We live in a free land because in other days men fought to make their country free with the courage that has written their names in letters of gold across the pages of history; and shall we fail our country now? Shall we be unworthy of the glory that is ours?

Let us hold fast, let us stand firm; let us be strong and of good courage.

COURTS OF JUSTICE. The appointment of special magistrates or judges to interpret and apply the law came in very early times. Usually they were selected from among the oldest and most experienced men of the tribe, men who were too old to fight and best fitted to decide disputes. Greece and Rome developed elaborate systems of courts of law, which were reasonable and just. Among the Teutonic tribes who overthrew the Roman Empire, law was merely organized custom, force and superstition became the basis of the modes of trial, and the judgments were delivered by the whole body of the freemen in their popular courts or assemblies. As the power of the state was restored, the courts came again to be the *king's* courts, jealously guarded as a source of revenue against the interference of the nobles, and using more reasonable modes of trial and law—the latter based in part on the solid foundation of the law of Rome.

This was, roughly, the origin of the modern court system. Gradually the courts, especially in England, gained more power and freedom from the influence of the rulers until they were recognized as a bulwark of the people against the tyranny of kings.

The Supreme Court of the United States

This development of the independent power of the courts has reached its highest point in the Supreme Court of the United States. That tribunal is the most powerful legal authority in the world. It has the right to set aside the laws passed by Congress or of any state if it considers them to be in violation of the Constitution. It has the authority to decide how federal laws shall be applied, and, in this sense, it almost has law-making powers. It settles disputes between states of the Union, as well as many cases between private parties. And its decisions are final.

The work of all court systems can be sharply divided into two parts: (1) the enforcement of the criminal laws by trying and punishing offenders against the state; and (2) the settlement of disputes between private citizens over the possession of property or other civil rights. These are called the *criminal* and *civil* functions of the courts.

The United States inherited the court system of England, and although there have been many modifications the fundamental principles remain the same in the two countries. The chief point of difference today lies in the division of judicial authority in America between the state and the federal courts. The state courts are descended from the old British colonial courts which existed prior to the War of Independence. The federal court system was provided for in the Constitution, to enforce its provisions and administer laws passed by Congress.

Divisions of the Federal Court System

The main divisions of the federal court system today are the Supreme Court, consisting of a chief justice and 8 associate justices; 9 Circuit Courts of Appeals, with 32 circuit judges; and 103 United States District Courts, each having a district judge. The United States District Courts have "original jurisdiction"—that is, the power to conduct the first trial of any case at law—in all criminal and civil matters which involve federal laws. The Circuit Courts of Appeals handle only those cases which have already been decided in the District Courts, but in which one side or the other, on serious grounds, takes an appeal. The Supreme Court, as has been indicated, has original jurisdiction in all cases in which a state is involved, and also hears appeals from all courts, state as well as federal, when a question of constitutional law is involved. All federal judges are appointed by the President, confirmed by the Senate, and hold office for life, unless removed by impeachment.

Character of the State Courts

The state courts are generally organized on the same lines as the federal courts. They deal with most cases of crime arising within the borders of the state to which they belong, and settle all civil disputes between the citizens of that state. Although states vary widely in the names given to their various courts, the system is generally the same. City, county, or district courts are the courts of lowest jurisdiction; cases may then be appealed to higher courts. Each state has a supreme or high appellate court, whose decision is final, except that cases involving rights under the Constitution of the United States may be appealed to the Supreme Court in Washington. The state supreme courts are authorized also to interpret the state constitutions. Small cases involving petty crimes or violations of city regulations are often tried in police courts; these correspond in power to the justices of the peace in rural communities. State justices and judges are usually elected for short terms of from two to six years.

England's "High Court of Justice"

The English court system, until 1873, consisted chiefly of the Court of King's (or Queen's) Bench, which dealt primarily with criminal cases; the Court of Exchequer, which dealt primarily with cases involving the royal or public revenues; the Court of Common Pleas, which decided property disputes between private citizens; and the High Court of Chancery, which decided cases "in equity"—that is, cases in which the law had to be modified or carefully interpreted to prevent injustice.

All these courts in 1873 were brought together under the name of the High Court of Justice, which with the Court of Appeal, forms the Supreme Court of Judicature. The court of last resort in England is the Judicial Committee of the House of Lords. It corresponds to the United States Supreme Court, except that it has not the power to declare a law unconstitutional. Cases arising in the British colonies are appealed to the Privy Council.

In England, as in America, special branches of the court system exist for trying divorce cases, probate or will cases, admiralty or maritime cases, etc. All English judges are appointed for life or good behavior, which insures a high standard of ability and freedom from personal or partisan bias.

The court systems of the other European nations differ widely from those of England and the United States. In general it may be said that the former, especially in criminal cases, do not protect the rights of the accused as effectively as the latter. Anglo-Saxon courts have always surpassed all others in the protection they afforded to the individual against tyranny and oppression at the hands of the government.

Courts-martial are military or naval courts to try offenses against military or naval law. They are the chief instruments for enforcing discipline in armies and navies, and their composition and procedure are laid down in laws passed by Congress or other national legislature. When "martial law" is proclaimed in a disturbed region (*see* Law) even civilians are subject to the summary procedure of the courts-martial. (*See also* Jury; Juvenile Courts; Law; Prisons and Punishments.)

COV'ENTRY, ENGLAND. Nowhere in England do the old and the new jostle each other in more striking contrast than in this venerable city, which is as famous for the automobiles and motorcycles it manufactures as for its quaint old buildings and the legendary and historical associations which cluster around it. The hum of factories today resounds in the streets through which good Lady Godiva took her famous ride—if ancient tradition is true—and in which quaint pageants commemorating the event have been held for centuries.

Coventry was founded in the middle of the 11th century, according to tradition, when Earl Leofric established a Benedictine monastery there. Not long after, the story goes, the Earl's wife, Lady Godiva, interceded for the townsfolk on whom the Earl had levied a tax so heavy that they would starve if they paid it. Contemptuously, Earl Leofric said he would remit the tax if Godiva would ride naked through the town at noonday. Godiva made this promise known to the people, so that they should keep within their houses behind drawn blinds. "Peeping Tom" ventured to look out, and he was struck blind.

The familiar phrase, to "send to Coventry," takes us back to the English Civil War of the 17th century, when Coventry was used as a place of imprisonment for supporters of the king. Population, about 105,000.

THE COWPEA AND ITS PODS

You can see for yourself that, although it is called a pea, this plant is really a bean. Look at those long pods and the broad leaves.

COWPEA. What clover is to the North and West as a means of enriching the soil and providing forage for cattle, the cowpea is to the region south of the clover belt. All parts of the plant are rich in nitrogen, making it the best possible preparation for succeeding crops; and for forage the plant may be utilized either as hay, for silage, or for pasturage. It also furnishes highly nutritious seeds.

The cowpea is more closely related to the bean than to the pea. It varies greatly in form, depending upon soil and climate, some varieties being erect or bushlike, and others distinctly trailing. The leaves are somewhat like those of the common garden bean. The pods vary in length from five to ten inches and contain numerous roundish seeds. Although grown chiefly in the Southern States, where it is known as the "cornfield" or "black-eye" pea, some varieties are cultivated in the North, and the beans are much relished as food for man.

The cowpea (*Vigna sinensis*) belongs to the natural order *Leguminoseae* of the family *Fabaceae*. It is a native of Asia and the Malayan region, but is now widely distributed in torrid and temperate zones.

COWPER, WILLIAM (1731–1800). Although thousands of people have laughed at his merry ballad of 'John Gilpin', the story of Cowper's life is a pathetic one. A shy sensitive little lad, he lost his mother when he was six years old and was sent from the rectory in Berkamstead, Hertfordshire, where he was born, to a boarding school, where he led a miserable life. Timid and homesick, he was persecuted by the older boys, as was so often the case in such schools. There was one bully of 15 into whose face he was afraid to look. He knew him by his shoe buckles and trembled at his approach.

Cowper could hardly have chosen a more unsuitable profession than the one for which he prepared. He studied law and was admitted to the bar. A clerkship in the House of Lords was opened to him, but he was terrified at the thought of the required examination. This mental strain, added to a natural tendency to melancholia, brought him to insanity. He attempted suicide, and was confined in an asylum for many months.

On his recovery, feeling himself incapable of an active life, he withdrew to the country, where he was tenderly cared for by devoted friends, especially by Mrs. Unwin, the beloved "My Mary" of his poems. A lover of nature and especially of animals, Cowper passed many pleasant hours in walking through the fields, gardening, and caring for his pet hares. But he lived always in the shadow of a great fear—the fear of a return of the insanity, which finally did again overtake him.

WILLIAM COWPER
Author of 'John Gilpin'

Cowper would probably never have written poetry had he not been urged to do so by his friends. He followed Mrs. Unwin's counsels like a child; and when, believing it would occupy his mind, she asked him to write poetry, he did as she bade. With the Rev. John Newton he wrote the 'Olney Hymns', some of which, such as 'God Moves in a Mysterious Way', are still found in the hymnals of today.

It was through the suggestion of another friend, Lady Austen, that he wrote his longest poem, 'The Task'. She advised him to write something in blank verse. "Set me a subject, then," said he. "Oh, you can write on anything; take the sofa," was her reply. So he "sang the Sofa," and the poem beginning in this way grew into 'The Task', a rambling poem filled with reflections on many subjects, relieved by touches of humor and interspersed with charming bits of nature description. It was Lady Austen, too, who told Cowper the story of 'John Gilpin'.

In Cowper's poetry we find the first faint notes of that song of nature and the beauties of simple life that was soon to be swelled by joyous songs of Robert Burns and the deep harmonies of Wordsworth.

Isn't this fairy-like cowslip just the thing you would choose to live in, if you were a fairy?

Cowslip. To the fairies belongs this fragrant, shining blossom of the English pastures, for dainty elfin sprites, it is said, lurk in the little clustered golden cups when spring showers drench the earth. It grows in many parts of Europe, but it seems especially a flower of England because of the prominent part it plays in the spring songs of her poets. The cowslip is a delicate modest little blossom, a close relative of the primrose. The pretty flower-clusters, nodding above rosettes of soft oval green leaves, splash the meadows with bright yellow in early spring. In America the wild blossom which is commonly known as the "cowslip," and also called the "marsh marigold," is neither true cowslip nor true marigold (*see* Marsh Marigold).

Scientific name, *Primula officinalis*. Flowers 1 to 1½ inches across growing in umbels of 6 or 8 that lean to one side; 5 petal-like sepals surrounding numerous yellow pistils and stamens. Leaves dark green and oval, growing in rosettes close to the ground. There is no true stem, but scapes, bearing the blossom clusters, rise from among the leaves to a height of from 6 to 10 inches.

Cox, Kenyon (1856–1919). By means of the beautiful mural paintings with which he has adorned many public buildings of the United States, and through his lectures and writings on art subjects, Kenyon Cox has had a very great influence upon the artistic education and development of America.

As a small boy, in the days when good paintings, especially west of the Alleghenies, were very rare, he happened to see a traveling exhibition of pictures at his home in Warren, Ohio. This made such an impression upon the beauty-loving boy that he determined to become a painter. A long and painful illness prevented him from beginning his studies until some years later, but when he was 13 he entered an art school in Cincinnati. From that time till the end of his life he followed art with the utmost devotion.

He came of a well-known family. His father was Gen. Jacob Dolson Cox, prominent in the Civil War and later governor of Ohio, secretary of the interior, and president of the University of Cincinnati. His mother was the daughter of President Finney of Oberlin College, noted as a religious and educational pioneer.

After studying for a year at Philadelphia, Kenyon Cox went to Paris, where he was a pupil of leading French painters. Upon his return to America, in 1882, his paintings began to attract attention, but they brought him more recognition than money. As a means of livelihood he turned to illustrating, in which he was very successful, because of his skill as a draughtsman and his ability to get rich and varied effects out of a few colors.

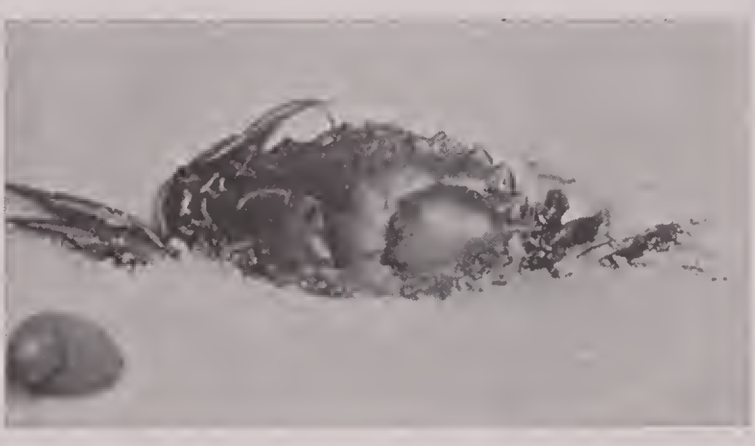
It was as a mural painter, however, that Cox showed his greatest power and earned his place in the foremost rank of American artists. Among his best works are 'Art and Science' on the walls of the Library of Congress; 'The Progress of Civilization', a series of eight beautiful lunettes in the State Capitol of Iowa; and other decorations in the Minnesota State Capitol, the Essex County Court House, Newark, N.J., and the Public Library of Winona, Minn.

His colors, though simple, are rich and full; but Cox is noted most of all for his balance and rhythm in composition. His beautiful figures, with their harmonious lines and true proportions, are expressive of lofty ideas. In all his paintings, as well as in his writings, he sought to uphold what he called the "classic spirit." In his own words: "The Classic Spirit is the disinterested search for perfection; it is the love of clearness and reasonableness and self-control; it is, above all, the love of permanence and of continuity. It asks of a work of art, not that it shall be novel or effective, but that it shall be fine and noble." These standards are reflected in his work.

His writings include: 'Old Masters and New' (1905); 'Painters and Sculptors' (1907); 'The Classic Point of View' (1911); 'Artist and Public' (1914); 'Concerning Painting' (1917).

THE SHORE CRAB "DIGGING IN"

When trying to escape from his enemies, the Shore Crab has a very clever way of burying himself in the sand. He's just beginning here.



By the vigorous use of his legs, the crab backs right into the ground. Here he is a few moments later.

Now our energetic friend is almost buried. He has kept one claw free to the end, so he can fight, if necessary.

CRAB. In its structure the crab closely resembles its relatives, the crawfish and the lobster. It differs from these in that its abdomen is very small and it carries it folded under its chest or thorax. In most forms the thorax is broader than long, and more or less flattened. The abdomen is narrow in the males and broad and rounded in the females. The crab resembles the crawfish and the lobster in having feelers, eye-stalks, jaws and five other pairs of mouth-pieces, five pairs of walking legs, and a shell or carapace (*see* Crawfish).

Crabs vary in size from the minute "pea-crab," which lives within the shell of the oyster and the mussel, to the "giant spider crab" of Japan, which often has a body 18 inches long and 12 inches across and sometimes measures 10 feet from tip to tip of its claws. The shape of the body, as well as the form and size of the first pair of legs, also vary greatly in different species. In the "hermit crab," which lives in the cast-off shell of a sea-snail or similar shellfish, the body has become greatly reduced in size because of its mode of life, and the *chelae* or claws have become very large. There are forms in which the first pair of legs are many times bigger and heavier than the rest of the body; and forms in which the body is very large in proportion to the size of the legs.

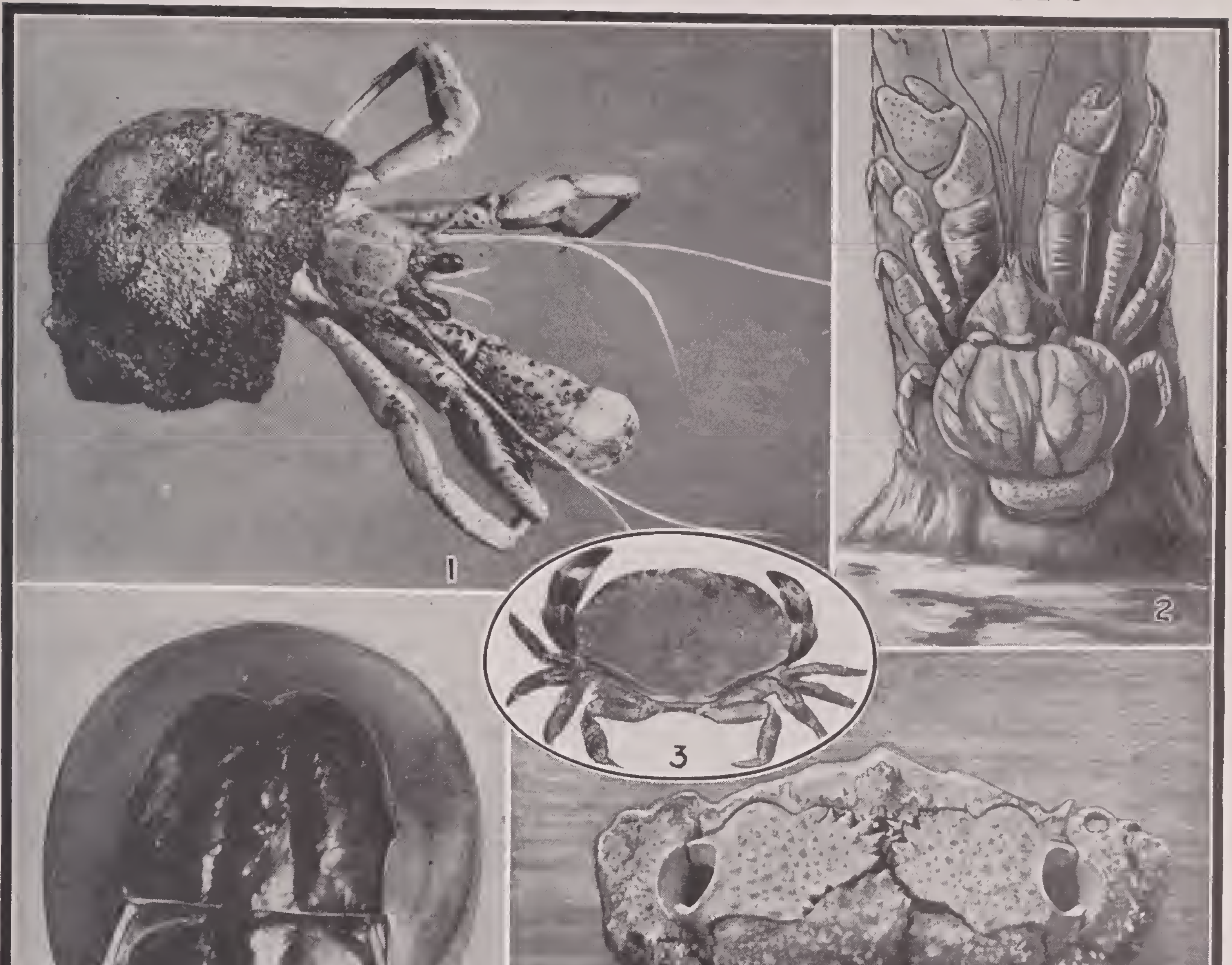
Most crabs live in the sea, and even land crabs visit the sea to lay their eggs, so that the young may pass the early stages of their lives in the salt water. Some shore crabs are able to live either on land or in water, while yet other forms live in fresh water only. Water-inhabiting crabs breathe by means of gills, but land crabs possess organs corresponding to lungs, which are carried under the carapace or body shell in the cavities in which the gills are found in water crabs.

Most crabs move about by walking or crawling in a peculiar sidelong fashion. A few forms possess flat paddle-like legs, and are able to swim. Some crabs feed on vegetable matter; others on smaller living animals; but most act as scavengers and devour dead or decaying organisms.

We know of no parasites among crabs, but some forms live as mess-mates, or "commensals," with other animals. Parasites hurt the living things to which they attach themselves; mess-mates help each other. The most widely known mess-mates are the pea-crab and mussel. This little crab lives within the mantle cavity of the mussel and enjoys protection from its enemies, while it in turn destroys organisms that might injure the mussel. Pea-crabs are also found within the shells of oysters. Some crabs live among colonies of coral animals, on which they form "galls." Another crab carries in each of its claws a living sea-anemone, which it uses as a means of defense and to aid in capturing its prey. Spider crabs are usually covered with dense growths of seaweed and sponges, which have been planted by the crab itself, and which form an effective disguise.

The hermit crab is a very interesting form. In its early stages it develops much like other salt-water

SOME CRABS WITH STRANGE HABITS



The Hermit Crab (1) never has a house of his own. He just moves into any sea shell he can find, and as he grows bigger he has to find larger and larger apartments. The Coconut or Robber Crab (2) inhabits the Pacific islands. He spends most of his time on land, living on coconuts. If they don't fall in sufficient quantity he climbs the palm after them. The Edible Crab (3) is only one of the many crabs that are caught for food. The King Crab or Horse-shoe Crab (4) is not a true crab at all, but is more closely related to the scorpions. He is like a knight in armor with his big curving shield. That long spike tail enables him to right himself again when he falls on his back. The Deep Sea Crab (5) draws in his food through those two big holes in his shell. Nearly all crabs are good swimmers, but the Swimming Crab (6), with those two flat paddle legs, is the champion. The Giant Spider Crab of Japan (7) often measures six and even eight feet from claw-tip to claw-tip, but as you see he's mostly legs.

EVEN WALLS DON'T STOP THESE CRABS

These are crabs of the West Indies on their way to the sea. Although they are land crabs, and live two or three miles from salt water, they go down to the sea in the spring for the females to lay their eggs. With the males marching on before, they go right over walls, houses—everything! Here you see them climbing somebody's garden wall.

crabs. Later it examines the shells of snails and other "gastropods," backing into first one then another until a shell is found that suits. With this it crawls around, only eyes and claws protruding to indicate the character of the tenant of the shell. Its abdomen becomes soft and spirally twisted to fit the shell. When the first shell is outgrown, it hunts for another, sometimes fighting with a brother hermit for possession. Shells inhabited by hermit crabs often are covered with living plants and animals, so that the crab with its borrowed house is a small living, moving museum. Some forms of this crab always place a living anemone on the shell; the anemone profits by the movements of the crab, which in turn is protected by the waving tentacles of the anemone.

Land crabs are found in tropical countries. The South Pacific islands are the home of the "coconut crab," which is able to climb the coconut palm and gather its fruit. Certain species found in the West Indian islands generally live two or three miles from the sea. They are remarkable for their annual spring migrations to the sea, in which the females lay their eggs. When the migratory instinct seizes them, they muster in a solid host covering an area about 40 yards wide and perhaps more than a mile long, the males in the lead. Hills, houses, churches, cliffs—nothing stops them or turns them aside from the direct course.

Many of the larger crabs are used for food. The most important edible crab of Europe is *Cancer pagurus;* of the United States, the blue crab of the Atlantic coast, *Callinectus sapidus.* Soft-shell crabs are merely ordinary crabs which have shed their outgrown shells, as is their habit, and whose new skin has not yet hardened to a shell.

CRACOW (*krä'kōw*), **POLAND.** From the higher of the two towers of St. Mary's Church, at the corner of the great stone-paved market-place of Cracow, you look off over a sea of roofs. Among them the slim spires of many churches sketch out rarely exquisite bits of medieval times. Far out toward the edge of the city stretches a broad band of green—broad walks, gardens, and rows of bright chestnut trees, where Cracow's encircling wall once stood. On a rocky eminence above the Vistula River, surrounded by grim ramparts, towers a cluster of buildings which includes the cathedral and the castle. This is the very heart of Poland, for in the 14th century cathedral the ancient kings of Poland were crowned, and there lie buried Poland's immortals, John Sobieski, Thaddeus Kosciusko, Joseph Poniatowski, and the poet Adam Mickiewicz. There also are the remains of St. Stanislaus, the patron saint of the Poles. From the royal castle which adjoins the cathedral, Poland was ruled for 400 years.

Cracow's university, one of the oldest in Europe, is partially housed in modern Gothic buildings, but the old ones are the gems of medieval architecture. In the lovely overhung court of the library building, rich with Gothic ornament, balconies, and columned windows, stands a bronze statue of the astronomer Copernicus, who studied there five centuries ago.

The ancient cloth-market in the midst of the marketplace is low and friendly in outline. Against the time-softened gray-brown of its old stones are silhouetted brilliant splotches of color—the bright kerchiefs and shawls of peasant traders, who come in from the country early in the morning. Here they spread their wares in the open air on flimsy little tables, or dump them in huge piles on the pavement—bright yellow cheeses, wonderful fruits, red cabbages and sugar-beets, melons, butter, and meats.

Some manufacturing of machinery, chemicals, and soap is done in Cracow. The city is more important for its commerce, due to its position on the left bank of the Vistula, which becomes navigable here, and because of the several rail lines which intersect at this point. Population, about 180,000, of whom 35,000 are Jews.

Cracow is said to have been founded in the 8th century by a mythical Polish prince named Krakus, from whom it took its name. The city was almost entirely destroyed by the Tatars in the 13th century. Austria obtained it in the third partition of Poland in 1795. At the peace settlement of 1815, Cracow and the surrounding territory was erected into an independent republic, but after an insurrection in 1846 it was taken over again by Austria and made a part of Galicia. It remained under Austrian rule until the peace terms of the World War of 1914–18 restored Polish independence, including in the new nation the Cracow region.

CRANBERRY. In the United States cranberry sauce occupies as customary a place on the Thanksgiving and Christmas dinner table as the fat turkey or roasted goose. The cranberry comes naturally by its place at these winter festivals, for it is peculiarly a winter berry. It ripens late and is so firm that it is easily kept until spring. In cranberry regions children make chains of the bright red berries to decorate the Christmas tree and very ornamental are the berries hanging on their own evergreen bushes. The bushes have trailing branches growing one to four feet long and bear inconspicuous flowers and round, oval, or pear-shaped berries on slender curving stems. The stems, curved like the neck of a crane, and the crane-bill shape of the tiny flowers are said to have suggested the name "crane-berry," which has been shortened to "cranberry."

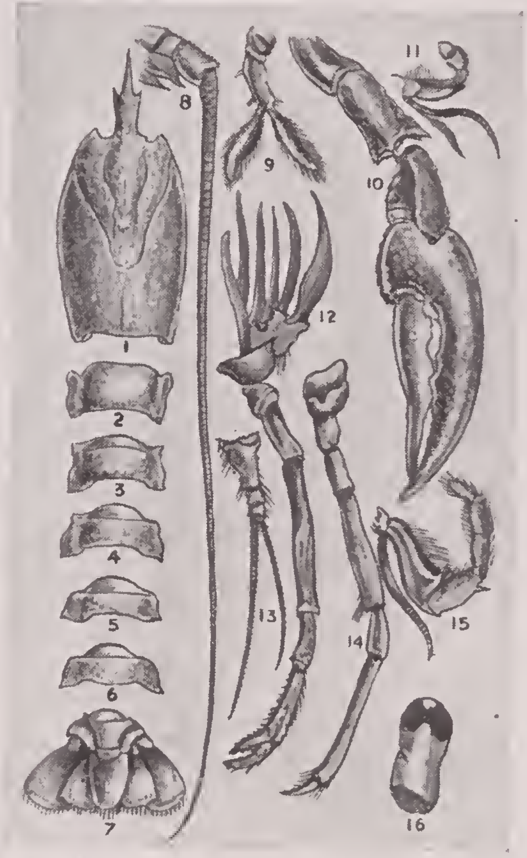
The cranberry grows wild in bogs and marshes of the temperate and cold regions of Europe and America. There are two main varieties, the small cranberry, which is widely distributed, and the large cranberry, which is native to the United States. The American variety is extensively cultivated. Land for the purpose must be easily flooded and as easily drained. It is flooded to prevent drouth, to protect the bushes from early and late frosts, and to destroy insect pests, and is drained for the ripening and picking seasons. Usually marshes where the cranberry or related plants are found growing wild make the best locations for the cultivated cranberries. Such lands are cleared of the wild growth and the cuttings of the cranberry bushes are set out in spaced rows. New plantings will begin bearing for market in about three years, and except to remove the weeds little cultivation is required. The chief regions for cranberry growing are in Massachusetts (Cape Cod), New Jersey, Wisconsin, and other northern states, and the total production is now more than 50,000,000 quarts.

The best grade of berries are hand picked, but the bulk of the crop is gathered with rake scoops. Sometimes the berries are simply raked from the bushes on to the ground and then the ground is flooded and the berries floating in the water are drawn down the sluiceways where they can be recovered easily.

Cranberries are of two distinct species of *Vaccinium*. The large American cranberry is the *Vaccinium macrocarpon* and the small variety the *Vaccinium oxycoccus*. They belong to the heath family, with the blueberry, huckleberry, snowberry, and wintergreen. There is also a "high bush" or "cranberry tree" which sometimes reaches the height of 12 feet. It is an ornamental shrub bearing scarlet berries that are not edible. The popular snowball bush has been developed from this same species.

CRANE. One of the largest of the wading birds; it resembles the heron in appearance, but in structure is like the rail. It is tall, long-legged, and long-necked, with a more or less naked head, but tufted in some species. The wings are short but powerful. A remarkable feature of cranes is the enormous development of the windpipe within the keel of the breastbone, where it is coiled and twisted before entering the neck. This causes the trumpet-like voice of the bird. (*See* Storks, Herons, and Cranes.)

PARTS OF A CRAWFISH



Here are the different parts of a crawfish: The segments of the body and the fan-like tail (1 to 7); Antenna (8); Swimmeret (9); Cheliped (claw foot), (10); Maxillipeds ("foot-jaws"), (11 and 15); Gills (12); Antennule (small antenna), (13); Walking Leg (14); Eye on Eye-Stalk (16).

CRAWFISH. The crawfish (also called "crayfish") is related to the crab, shrimp, and prawn, and closely resembles the lobster. It has been used for food all over Europe for many centuries, and in France where it attains a large size it is extensively bred. An American species which is six inches long when full grown is found on the Pacific coast.

The crawfish lives in fresh-water ponds, lakes, and streams, and often burrows in the soft earth of their banks. The levees of the Mississippi River are frequently weakened by these little crustaceans, causing breaks and far-reaching floods. The crawfish feeds upon insects, snails, tadpoles, and other animals, and devours dead or decaying organisms as well.

The body is covered with a hard horny shell of *chitin* incrusted with lime. The shell is jointed and is thick and hard between the joints, but the covering of the joints is thin and flexible, so that the hinder part of the body, or abdomen, can be folded like a roll of paper. The tail is jointed and resembles an open fan. The eyes are on movable stalks and each eye patch is composed of hundreds of simple eyes.

Just behind the eye-stalks are the feelers—two long ones and two short ones; these are thought to be organs of touch. The mouth is under and in front of the base of the feelers; here are the jaws and five other pairs of mouthpieces which assist in biting or holding food. Six pairs of jointed swimmerets are attached to the abdomen.

The eggs are attached to the swimmerets of the female and carried for several weeks till they hatch. For some time after hatching the young cling to the mother. At first each looks like a little round white ball. Later the ball becomes oval, with curious pouches on its surface; then this changes to a creature with a big head, short tail, and prominent eyes. Later a shell forms which is molted or shed as the animal grows, until the adult stage is reached. After the first year the shell is molted and renewed annually.

Several species of blind crawfishes live in caves, one species being found in the Mammoth Cave, Kentucky. There are crawfishes in South America but none in Africa, although one species is found on the island of Madagascar. They are absent in most parts of Asia, but are found in Australia and New Zealand, where some forms attain a large size and are used for food.

Scientific name of European genus (also found on the Pacific coast of North America), *Astacus;* of American genus (east of the Sierra Nevada Mountains), *Cambarus.*

What the CRAWFISHES had to say for themselves

I AM a crawfish and you may find me any summer's day by looking under the stones in the bed of the creek. I am not so fierce as I look, although I can pinch your finger and make it bleed.

"What do you say? I look like a lobster! So I do, but then, you see, the lobster is my cousin!—and the crab is my second cousin. Near relatives often resemble one another, you know. But the lobsters and my people parted company long ago. The lobsters live in the sea and they never forgave us for making our home in fresh water. You are quite right; I am *not* a fish, although I live in the water and breathe through gills.

"You have a skeleton on the inside of your body, but I carry mine on the outside. It is a very good skeleton, and it also serves to protect me from my enemies, like the armor of the warrior knights of old. Do you know any other animals that wear their skeletons on the outside of their bodies? Inside the skeleton, my body is something like that of an earthworm. Someone has said that a crawfish is only an earthworm dressed in armor; but I am sure that is not so. I belong to a much higher order of animals than the earthworm, and my organs and habits are quite different.

Queer Babyhood of the Crawfish

"You would never have guessed that the little creature that I was at my birth would one day be a crawfish. I did not look like a crawfish at all. I had the most comical head and funniest little tail that you can imagine. After a while I changed my appearance entirely and a shell grew on my body. In a few days I grew tired of the shell, which was too small for me, so I just crawled out of it. Within a few days I grew a new skeleton, a little more like my present one; but soon I became tired of that, too, and cast it off. I changed shells several times, each new one a little larger than the last, before I made the one I am now wearing.

"Oh, yes; I shall discard this one too, some day. Already I am beginning to feel cramped in it.

"Perhaps you have noticed that I have two big pincer-claws. If one of these should be broken off I should grow a new one the next time I change my armor. You are surprised at that? If I should lose a leg, or even an eye, I would grow a new one when I put on a new coat.

Why the Crawfish Wears Whiskers

"Have you noticed my feelers? Those two long whip-like strands extending forward from my head? They are very useful to me. They serve me in the same way that whiskers serve the cat. I have four pairs of legs for walking, but I am not a good walker. Sometimes I have to use my arms, or pincers, to help drag my body forward. I can swim with the help of the little paddle-like limbs under my body. My legs are of little use to me in swimming. As a matter of fact, I am not much of a traveler. When I want to get away from an enemy, I fold my tail under my body and poke my big claws into the sand or mud and push myself back.

"Should you like to learn how I get my food? My favorite method is to lie within the doorway of my burrow, in the bank of the creek, with just my big claws, feelers, and sharp eyes outside. Then when a bug, insect, or baby fish comes along, one of my big claws darts out and seizes it. If it has bones, or a shell, I crush it with my pincers, and then carry it to my mouth with the smaller pincers on my second pair of legs, which I use as you do your fork.

"Now I must leave you, children, and return to my home in the creek. I like to get on dry land sometimes, for a little while, but I cannot live long out of the water. Good-by."

Mrs. Crawfish and Her Hundred Babies

A few days later the children were sitting on the bank of the creek, under the leaning willow, listening to the rippling of the water over the white stones, and wondering what had become of the crawfish that told them its wonderful story. Suddenly Robert caught sight of something wriggling under the edge of a stone, in shallow water near the shore. With a glad shout he raised the stone and quickly brought forth his prize.

"How do you do, little ladies and gentlemen?" said a cheerful voice. "I am very glad to see you."

The children were so astonished that they forgot to return the friendly greeting. For a moment no one spoke, then all talked at once.

"O Mr. Crawfish!" they shouted in chorus, "we are so glad to see you again! We came here to look for you."

"Ha! Ha!" laughed their visitor. "You think I am Mr. Crawfish, but you are mistaken. I am *Mrs.* Crawfish. It is not surprising, however, that you should make such a mistake. Mr. Crawfish and I look very much alike.

"You see," she continued after a pause during which no one spoke, "Mr. Crawfish crept out of his old shell this morning. It was a hard and painful task, and he is not feeling as well as usual. He will be himself again in a few days, after his new armor has become a little harder. So I came instead, although I am very busy just now. Don't you think you would be busy, too, if you had a hundred babies to care for at one time?"

"O please, Mrs. Crawfish," Robert asked politely, "how can you take care of so many babies without some of them getting lost, or being carried away by the stream?"

"Mother Nature has shown us how," Mrs. Crawfish replied pleasantly. She was pleased to know that the children were interested in her.

"Mother Nature," Mrs. Crawfish continued, "provides for the babies of all things, whether they are animals or plants. And every nice girl who means to grow up and become a good mother, and every boy who wants to become a good wise man, should learn how the children of animals and plants live and grow.

Where Mrs. Crawfish Carries Her Babies

"Now, if you will pick me up, you will find my babies fastened to the swimmerets, as they are called, on the under side of my body. They will stay with me nearly two weeks longer, until they have their first shells. Then they will begin to crawl over my body, or swim around me, and play like any other children. But they will always return to their places to rest, until they are grown up and able to take care of themselves.

"You can learn much about life by studying the crawfish. And do you know," she said with a wise nod of her feelers, "life is the most important thing in this world. If people knew more about it they would value it more highly. The real purpose of our learning anything is to make living easier, and to make ourselves and those about us better and happier. Boys and girls who have learned to read from Mother Nature's story-book will never be lonely in the fields or in the woods, no matter how far they are from home. For every living thing has a story, and most of their stories are as interesting as those that Mr. Crawfish and I have been telling you."

CREDIT. The tremendous importance of credit today is reflected in the fact that modern society is often called a "credit society," the implication being that credit is the most important factor in it. "Credit is the life-blood of commerce," and "Credit is the heart and core of the modern business structure," are other statements that are frequently made. Without credit our great business corporations would be impossible, for no one man could supply all the capital that is necessary for them. Nor would there be enough money in the world to carry on the ordinary business transactions. It is estimated that from

50 to 60 per cent of the retail trade and more than 90 per cent of the wholesale trade of the country is settled by checks, drafts, and other credit instruments. This means that in the majority of business transactions no money changes hands except to cancel the small balances of the banks at the clearing houses.

The word "credit" is derived from the Latin *credere*, which means to believe or trust. Credit is based upon confidence in the intention of the borrower to pay at some future time, and upon belief in his ability to do so, which is measured by his property. A simple illustration of credit is found in the accounts which people carry at local stores, and in the promissory notes which borrowers give. The same principle, however, is the basis of mortgages, stocks, and bonds, all of them involving a promise to pay money at a future date. Purchasing power is thus transferred to the borrower, and credit has therefore been defined as "permission to use another's capital."

In this transfer the banks, which are the great reservoirs of credit, play an indispensable part. They collect the small sums of money which would remain unproductive in the hands of individuals and invest them in large amounts in trade and commerce, thus greatly increasing the total means of production. (*See* Banks and Banking; Stocks and Bonds).

CRE'OSOTE. No wholly satisfactory substitute has ever been found for wooden railroad ties, and even though they are made of very hard wood, the damp earth and the terrific strain to which they are subjected would rot and destroy them in a comparatively short time were they not treated with some preservative. Creosote oil, one of the valuable products in the distillation of coal and wood, is generally used for this purpose. The wood is placed in air-tight tanks from which the air has been pumped, and the creosote, heated until it is a heavy vapor, is introduced. The vacuum and the high temperature drives out all the moisture in the wood and saturates it with the oil. Telephone and telegraph poles and other wood surfaces exposed to the weather are similarly treated.

Creosote is a colorless oily liquid with a strong odor. When made from beech wood it is particularly valuable in surgery and dentistry for its antiseptic properties, especially in diseases of the lungs. Its use as a preservative of meat gives it its name from the Greek words meaning "meat preserver." The wood smoke used in preserving hams and bacon in the old-fashioned farm "smoke-house" derived something of its preserving value from creosote.

CRETE. The rugged island of Crete has been famous in legend and history for 5,000 years. Lying in the eastern Mediterranean, athwart the Aegean Sea and nearly midway between Europe, Asia, and Africa, it has been the football of the three continents. Egyptians, Romans, Saracens, Venetians, Turks have been its masters, but none has been able to hold it without costly expenditure of lives and money. The Cretans have been as tireless in revolting against foreign masters as in fighting one another in the days of their independence. Since 1913, however, the island has been a part of the kingdom of Greece, to which it belongs by race, language, and spirit.

As the seat of the first European civilization and the stepping stone by which the arts and sciences of Egypt and Asia passed over to Europe, Crete is one of the most interesting spots in the world to the student of history (*see* Aegean Civilization). Excavators have uncovered ruins buried beneath the débris of 3,000 years, telling the story of the wealthy, powerful, and highly developed civilization that arose there nearly 5,000 years ago. At the ancient capital Cnossus they have laid bare the remains of the great palace of King Minos, celebrated in Greek legend, and which are so intricate in plan and vast in extent as to suggest an explanation of the legend of the labyrinth in which the Minotaur was imprisoned.

Crete is the fourth largest island of the Mediterranean, 160 miles long and from 7 to 35 miles wide. A high chain of mountains, snow-crested throughout much of the year, forms the backbone, falling away in gradual slopes on the northern side, and on the south breaking in precipitous cliffs to a rocky shore. In the center rises Mount Psilorati (8,000 feet), the ancient Mount Ida where Zeus, according to one Greek legend, was born. Many narrow ravines, so deep that the sun's rays never penetrate them, and huge caves provide convenient hiding places. Numerous springs water the valleys, which would be highly productive if the agriculture were of any but the rudest sort. Vines and groves of olive, lemon, and orange trees are grown on the lower hills and lowlands, but the once luxuriant vegetation of the higher slopes has long since disappeared, save for a few cypresses, chestnuts, and oaks.

The Cretan people are primitive and mostly illiterate. Millenniums of warfare have left them farther back in progress than their remote ancestors. Under the rule of the Turks most of them became Moslems, but today about two-thirds of the 344,000 inhabitants are of the Greek Orthodox faith. The Moslem element still predominates in Candia, the capital, and in Canea, the principal trading city. The manufacture of soap and cheese and the export of oil and fruits are the principal industries.

After the Greek invaders overthrew the early Aegean civilization (before 1000 B.C.), the Cretans never occupied an important place in history. They spent their powers fighting against each other. Following the breakup of the Roman Empire the island passed into the hands of the Saracens and became a nest of Mohammedan pirates. Reconquered by the Byzantine or East Roman Empire in 960, it became a part of the spoil of the Venetians in 1204, at the time of the Fourth Crusade. In 1669, after a 20 years' siege—the longest in modern history, in which 150,000 men were killed or wounded—the Turks took Candia and the whole island.

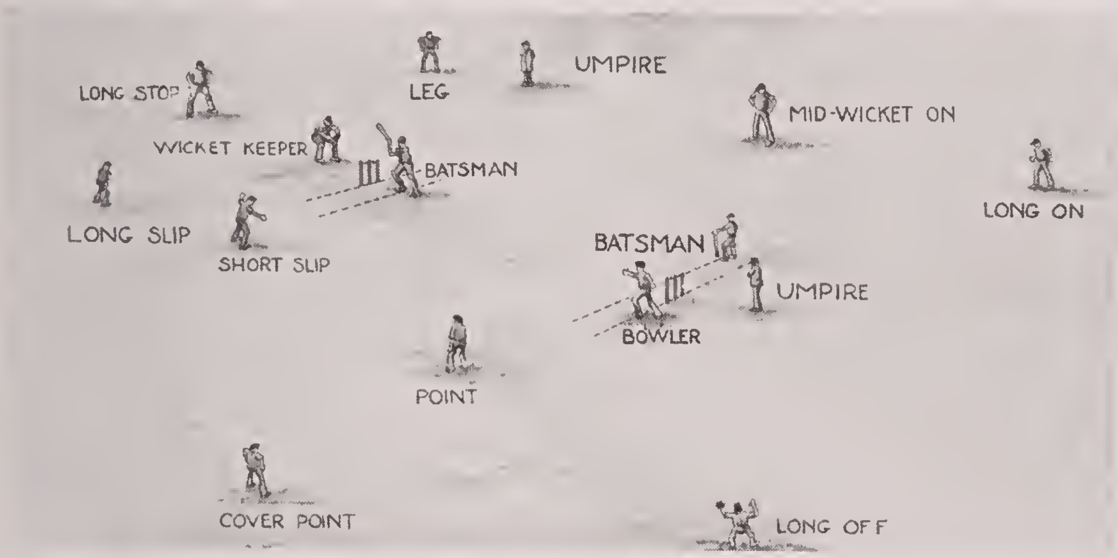
From that day almost until the present, insurrection followed insurrection, and the Christian and

Moslem populations were often fighting each other. In 1898 the great European powers placed the island under a Christian high commissioner. Under the leadership of Eleutherios Venizelos (*see* Venizelos, Eleutherios), this makeshift government was overthrown; and after the Balkan War of 1913 the powers finally consented to the union of Crete with Greece.

CRICKET. The national game of the English race is cricket, just as baseball is the national game in the United States. In Great Britain and the British colonies boys learn to play the game as soon as they can hold a bat; every school and college and university has cricket teams, and later on professionals provide amusement for cricket "fans." Cricket is also played by many big amateur clubs.

The cricket field consists of a wide stretch of turf, in the middle of which are two "wickets," 22 yards apart and facing each other. A wicket consists of three "stumps" (round straight pieces of wood) of equal thickness, standing 27 inches upright out of the ground. The distance between the two outer stumps is eight inches, the third being midway between. Lying loosely in grooves across the top of the stumps are two "bails," each four inches long. A whitewashed "crease," eight feet eight inches long, is drawn on the turf in line with the wicket stumps. This is called the "bowling crease." A similar line called the "popping crease" is drawn four feet in front of the wicket, and parallel to the bowling crease.

HOW THE PLAYERS ARE STATIONED ON A CRICKET FIELD



You will notice that there is no "foul" ground in cricket as there is in baseball. The players completely surround the batsman's position at the wicket, and the ball may leave the bat in any direction.

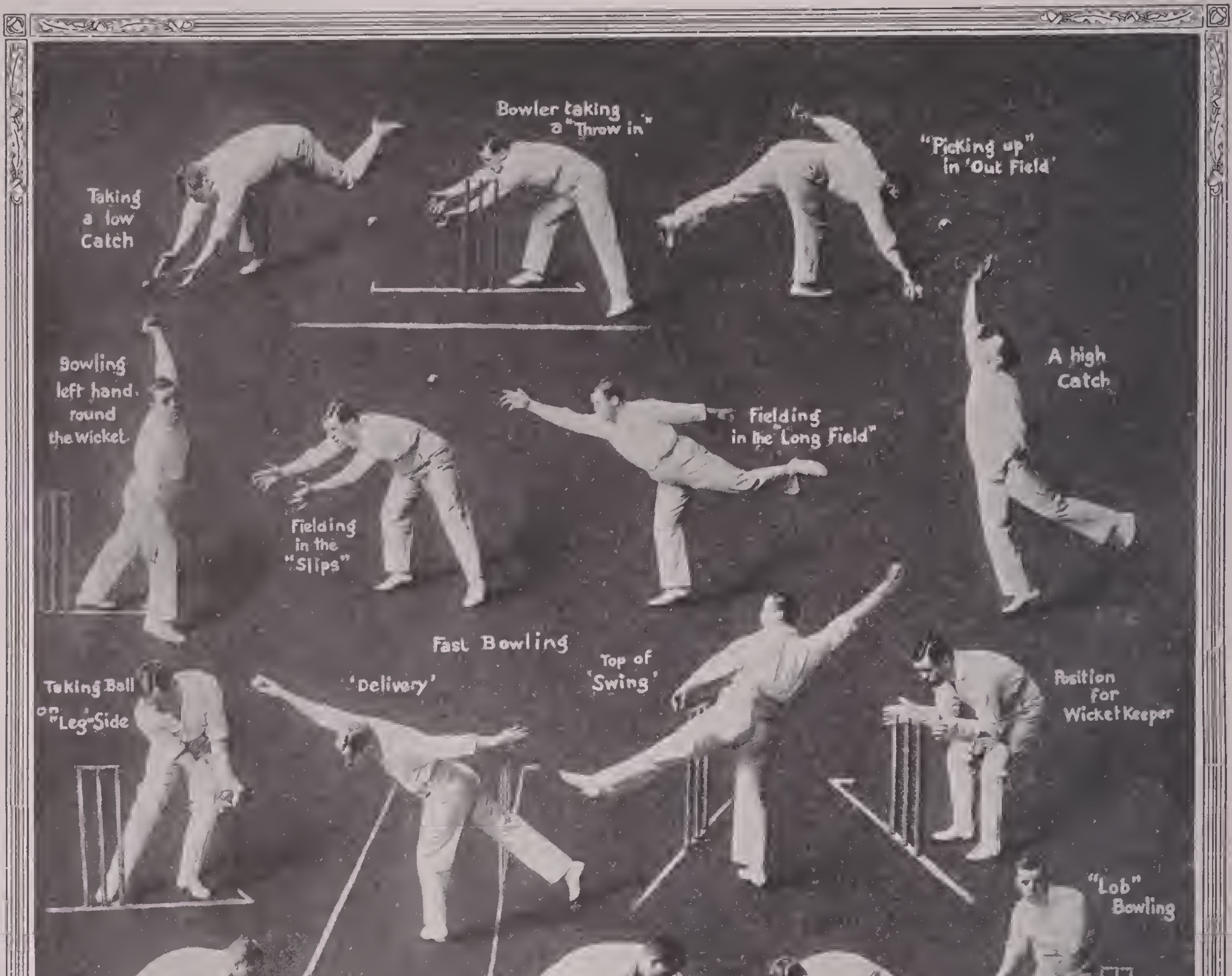
The bat used in cricket is usually made of willow. Its length is limited to 38 inches, but 36 inches is the usual size. It has a handle 14 inches long, made of spliced cane, and a flat blade $4\frac{1}{4}$ inches wide and 22 inches long. Its weight varies between $2\frac{1}{4}$ and $2\frac{1}{2}$ pounds. The ball is made with a core of cork, around which are wound layers of fine twine and thin cork shavings until the proper size is reached, when a cover of heavy red leather is sewed on with six parallel seams. The ball must weigh not less than 5 ounces nor more than $5\frac{3}{4}$ ounces, and must be not less than 9 inches nor more than $9\frac{1}{4}$ inches in circumference.

The game is played by two teams, each consisting of 11 men. The captains "toss up" for innings and the winning side has the choice of batting or fielding first. Two men are always at bat at the same time, one at each wicket. The batters or "strikers" must stand between the bowling crease and the popping crease. The "bowler," who corresponds to the pitcher in baseball, stands behind the bowling crease at one wicket and "bowls" at the other. This bowling differs from pitching in that the hand must never rise above the shoulder in delivery, nor must the ball be thrown with a jerk. The object of the bowler is to hit the opposite wicket with the ball after it has bounced once off the ground in front of the wicket. The batter's object is to protect his wicket by striking the ball out of the way or by letting it glance off his bat out into the field. There are no "foul lines" in cricket and the fielders are scattered around on all four sides of the wickets. After the bowler has pitched six times, the umpire calls "over," and another bowler at the opposite wicket takes the ball and pitches in the reverse direction, while the second batter defends his wicket.

Runs are scored when a batter at one wicket strikes the ball and exchanges places with the other batter, each exchange counting a run. The most runs allowed from one hit, however, are six. A batter is out (1) if the bowler hits the wicket with the ball and dislodges the bail; (2) if the ball, after it is struck by a batter, is caught by any fielder before it touches the ground; (3) if a batter gets outside the popping crease and the "wicket-keeper," who corresponds to the catcher in baseball, knocks off the bail with the ball or with the hand holding the ball; (4) if a batter stops with his legs or body a ball which in the judgment of the umpire would have struck the wicket; (5) if a batter knocks a bail from the wicket while batting; (6) if the bail is knocked off the wicket by any fielder who holds the ball, while the two batters are trying to make a run. In the last case, the one of the two batters who is nearest to the wicket where the bail is knocked off is out.

"Extra runs" are counted by the umpire if the bowler throws the ball beyond the reach of the batter, or if the bowler gets outside the bowling crease, or if he jerks or throws the ball in an overhand pitch. Runs may also be scored if the wicket-keeper fails to stop a ball, letting the batters exchange places.

SOME CRITICAL MOMENTS IN A CRICKET GAME


Taking a low Catch
Bowler taking a "Throw in"
"Picking up" in 'Out Field'
Bowling left hand. round the Wicket
Fielding in the "Slips"
Fielding in the "Long Field"
A high Catch
Fast Bowling
'Delivery'
Top of 'Swing'
Taking Ball on "Leg" Side
Position for Wicket Keeper
"Lob" Bowling
"Stumped"
Taking Ball on 'Off' Side
Bowling round the Wicket.
"Run out"
Round the Wicket.
Top of "Swing"

Here you see various incidents in the great summer outdoor game of Great Britain. Most of the pictures explain themselves, once you have read the article on Cricket, but a few may require further details. "Bowler taking a 'throw in'," for instance, means that one of the batsmen has hit the ball, the ball has been "fielded," and is being returned to the bowler, who will attempt to knock the wicket before the incoming runner reaches the "popping crease." The pictures in the center show how the ball is "bowled" in cricket, with a straight arm motion. "Lob" bowling is done with an underhand motion. If a batsman moves out of the popping crease and the wicket keeper meanwhile is able to knock the wicket with the ball, the batsman is out, just as if the bowler had hit the wicket.

Each team stays at bat until ten men are out, the eleventh man having no partner at the opposite wicket. The game usually consists of two innings for each team, which sometimes makes a match last for three days, piling up enormous scores.

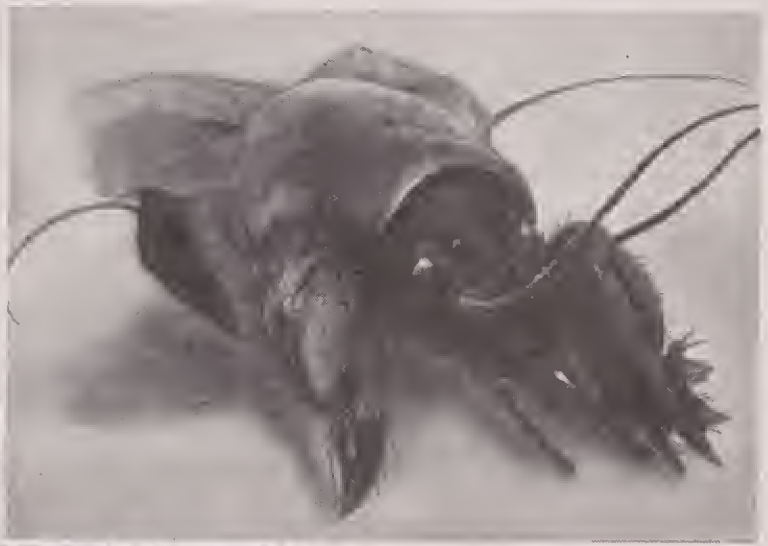
Although cricket is generally considered by Americans a much slower game than baseball, it calls for long training and great skill, especially in batting and bowling. Expert bowlers produce the same effect as a "curve" by giving the ball a twist, so that it "breaks" when it strikes the ground. Greater accuracy is said to be required for bowling than for pitching in baseball. Batting in cricket also gives more opportunity for "placing" the ball, since the field on all sides of the batter is "fair ground." No player wears gloves in cricket except the wicket-keeper and the batter.

CRICKETS. The musical "chirrup, chirrup" of these little insects is such a pleasant sound that the phrase "as merry as a cricket" has become proverbial. In his famous story, 'The Cricket on the Hearth', the novelist Dickens makes the plot center about the joyous chirp of a cricket, who sings when things are going smoothly and is silent in times of trouble.

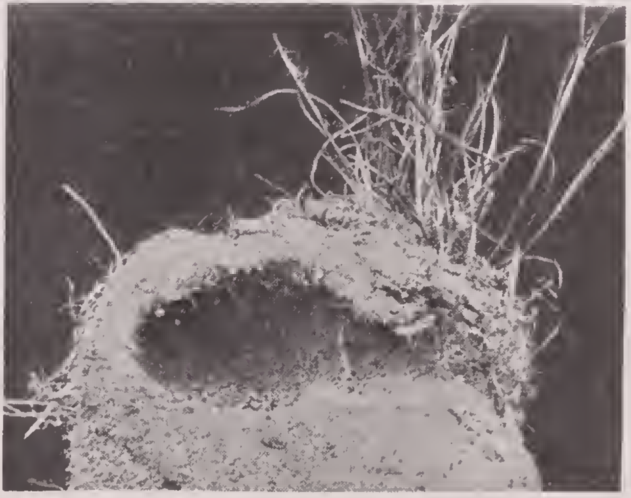
The house cricket is not so often found in America as the field cricket, whose shrill song is heard on summer nights in all parts of the country. Only the male crickets "sing." The sound is produced by rapidly rubbing a sort of file on the hind legs against the rough surface of the fore wings. These wings are no longer used for flight, as the cricket has long powerful legs for leaping. Its body is a beautiful shining black, about an inch long, with long antennae, or feelers. It eats anything and sometimes gnaws holes in damp clothes put before the fire to dry at night. The female lays her eggs in the ground in autumn and they hatch out the following spring.

THE CRICKET THAT SINGS AND THE CRICKET THAT DIGS

The House Cricket is the most cheerful of insects. When he isn't "singing" he's running and jumping about in a careless way that often gets him into trouble.



The Mole Cricket is much more solemn, spending most of his time under ground. He's a powerful creature that fairly "swims" through the soil with those great arms.



When the Mole Cricket gets tired of pushing his way around under the sod in search of the tiny insects on which he dines, he retires to a quiet little nest like the one we see here.

The field cricket leads a solitary life, taking shelter under trees or stones during the warm months and digging a burrow with a small chamber at the inner end during the winter. Here it spends the cold months, only appearing occasionally at the entrance to take a look at the weather. The males are decidedly quarrelsome, especially during the mating season and fight whenever they meet. Such fights are unusually gentle, however, considering the usual insect code, for the victor does not slay his vanquished foe.

Besides the true crickets, there are two other kinds: the mole crickets and the tree crickets. The mole crickets are curious creatures, with their first pair of legs broadened, turned sidewise, very strong, and furnished with stout digging claws. They look and act much like tiny black moles, and hence their name.

The tree crickets are the most beautiful and dainty members of the whole family. They are usually a pale apple-green, or white tinged with green. They live on trees or shrubs, which they sometimes damage by boring into them to lay eggs. One species of tree cricket lays its eggs in the stems of the raspberry. Scientific name of common house cricket, *Gryllus domesticus*. *Gryllus niger* and *Gryllus neglectus* are American field crickets.

CRIMEA (*krĭ-mē'ȧ*). The Crimea's situation in the Black Sea, between Europe and Asia, has made it for over 24 centuries a tempting prize alike to Greeks, Tatars, Turks, and Russians. It is a four-sided peninsula projecting southward from Russia, and it is entirely cut off from the neighboring coast except for the narrow isthmus of Perekop. Even this is now cut through by a canal, so that in fact the Crimea is an artificial island. It is about 200 miles long from east to west, and 125 miles from north to south; its area is a little larger than that of the state of Vermont. Its eastward extension helps to inclose the Sea of Azof, an arm of the Black Sea.

The Crimea was once famous for its wheat, but in recent years it has suffered much from drought. Cattle, horses, and camels are raised, good wine is produced, and porphyry, limestone, and salt are mined. The southern coast enjoys a climate which is Mediterranean in character, and here were summer places of the Russian czar and his nobles. The population is chiefly composed of Turkish-speaking Tatars, with an admixture of Russians, Greeks, Turks, etc. Over the steppes of the northern half are scattered burial mounds of the ancient Scythians.

The Crimean War (1853–56), so named because it was fought chiefly in this peninsula, was caused by Russia's attempt to establish its protection over the Christian subjects of Turkey, who, like the Russians, belong to the Greek Catholic faith. Turkey was aided by France, England, and Sardinia, who feared to see Constantinople made the prize of the Russian czars. The battles of the Alma, Balaklava, and Inkerman were fought; and the fall of Sebastopol, the strongest fortress of the Russians, brought the war to an end. By the treaty of peace Russia gave up practically all she had gained during the war. In this conflict occurred the 'Charge of the Light Brigade', immortalized by Tennyson's poem.

CROCKETT, DAVID (1786–1836). David Crockett, pioneer, hunter, and politician, was the son of an Irish emigrant who, after fighting valiantly at the battle of King's Mountain, in the Revolutionary War, had crossed the mountains from North Carolina and settled in the wilderness of Tennessee. The family was poor and David received no education except that of pioneer experience. At the age of 12 he was apprenticed to a teamster and a year later to a hatter. He returned home when he was 15 determined to get an education, for he did not then know "the first letter in the book." Learning was more difficult to acquire than he had thought, and at the end of six months he gave up the attempt. The books which he is supposed to have written in later life, including his autobiography, were probably dictated.

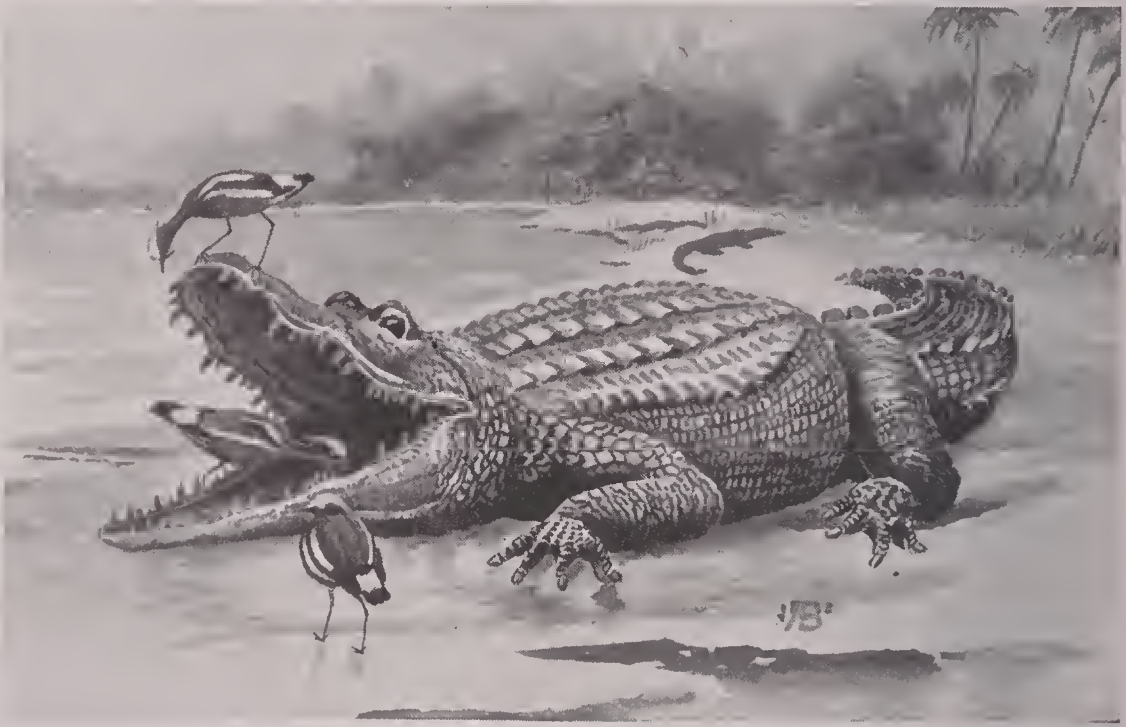
If Davy Crockett could not write, however, he could shoot, for he was known as the best shot in Tennessee. This accomplishment, and his size, strength, and good nature made him extremely popular with his neighbors. His splendid service under General Jackson in the war against the Creek Indians in 1813 was followed in 1821 by election to the Tennessee legislature.

It was his shrewd stories, perhaps, as much as anything, that won for him two terms in the legislature and two in the United States Congress. At Washington his queer dress and ready wit won him attention, but he was too independent to vote always with any one party. He opposed some of Jackson's policies, and lost his seat in Congress in 1835.

Disgusted at this end of his political career, Crockett decided to go to Texas to help that state in its struggle against Mexico. His participation in the war was short, however, for in the first conflict, that of the Alamo (*see* Texas), he lost his life, being killed along with the other defenders of the fort after the Mexicans had captured it.

CROCODILE. In the tropical forest an antelope steals cautiously down to the river's brink. It fails to observe the dirty gray log lying motionless in the shallow water—a 12-foot log that suddenly turns into an active monster, web-footed, scaly, with straddling legs, long tail, greedy eyes, and huge hungry jaws. A splash, a terrifying roar, a sudden agonized cry, and the antelope is dragged under and disappears.

THE CROCODILE'S INVITATION TO DINNER



You naturally think that it's the Crocodile who is about to dine, but you're wrong. The Ziczac or Crocodile Bird is a guest and not a dish in this case. He picks leeches and other parasites from the Crocodile's lips and gums, and the great monster, in return, resists the temptation to close those terrible jaws.

The dragon of this true fairy story is the crocodile, a lizard-like, flesh-eating water reptile that was worshiped by the ancient Egyptians and is still held in religious awe in certain parts of India. This sinister monster eats not only fish, birds, dogs, cattle, ponies, and deer with a relish, but devours its own relatives. Although crocodiles usually avoid man, the natives of India, Africa, and South America tell blood-curdling tales of bold attacks made on fishing boats. And many a swimmer in tropical waters has felt the sudden fatal grip of those long sharp teeth as he has been jerked under, never to appear again.

Three species of crocodile are found in Central and South America, and in the West Indies. They are often mistaken for their close relatives the alligators (*see* Alligator). The Indian crocodile is the largest, one monster 33 feet long being on record. The best-known species is the crocodile of the Nile, which has been nearly exterminated on the lower river by skin hunters; it is still plentiful in upper Egypt.

All crocodiles lay eggs, which are covered with a hard thick shell and are about the size of large hens' eggs. From 30 to 60 of these eggs are buried in shallow holes dug in the sand or mud near the water's edge, where they are hatched by the heat of the sun into baby crocodiles eight inches long. These grow rapidly into horny monsters from 10 to 20 feet in length, depending on their species. Scientists believe they live for two centuries or more.

Crocodiles are hunted for their tough skin, which makes good leather; for their musk glands, which make perfume; and for their fat, which is also of some commercial importance. They belong to an order (*Crocodilia*) which includes besides the crocodiles proper the narrow-snouted *gavials* of India, and the broad-snouted *caymans*, *jacares*, and *alligators* of America. There are nine species of the true crocodiles, which are distinguished by the arrangement of their teeth.

Crocus. When winter snows are melting, trees are budding, and the winds of March carry with them a hint of spring, the cheerful crocus bobs up here and there, "the morning star of all the flowers," its blossoms of blue and purple and yellow and white touching our gardens with beauty.

These heralds of spring, natives chiefly of the south of Europe and of the East, have many different species that thrive in almost any climate or soil. They all look a good deal alike with their pretty funnel-shaped flowers and grasslike leaves springing up from the "corm, " a short thickened bulblike stem protected by scale leaves. But whether its blossom is that of the common spring crocus, or one of the many beautiful cultivated hybrids, thousands and thousands of whose corms come to us from Holland each year, the "lowly crocus" is one of the most welcome of all the flower visitors in our gardens. One member of the genus is useful as well as beautiful, for its dried stamens give us the yellow saffron which is employed in medicine and as a flavoring and coloring material in the kitchen.

The crocus is a genus of the Iris family (*Iridaceae*) and has about 70 species, of which the best known are the spring crocus (*Crocus vernus*), some of the Dutch hybrids of *Crocus maesiacus*, and the saffron crocus (*Crocus sativus*). Their flowers are showy, solitary, long, funnel-shaped, and erect, of six nearly equal segments. They have three stamens and the three-celled ovary contains numerous seeds. The corms are about one inch in diameter

Croesus (*krē'sŭs*), **King of Lydia.** "As rich as Croesus" became a proverbial expression in ancient times, for this famous king, who ruled 560–546 B.C., was reputed to be the wealthiest of all monarchs. His kingdom was the fertile land of Lydia in western Asia Minor, on the shores of the fair Aegean. The hillsides were clothed with vines and fir trees, and fields of grain covered the valleys. Gold from the mines and from the sands of the River Pactolus filled the king's coffers to overflowing. The Lydians in the time of Croesus, it is believed, were the first of all peoples to coin money. Industry and commerce were developed and the power of Lydia was extended throughout Asia Minor until it became a great empire.

The fame of the splendid court of Croesus at Sardis resounded throughout the Greek world, and attracted many eminent visitors. One of these, legend tells, was Solon, the wise lawgiver of the Greeks. When the king proudly displayed his treasures and asked Solon who was the happiest man that he had met, he expected Solon to reply, "Thou, O King." But Solon named two or three obscure men who had lived and died happily. Croesus was surprised and angry, and said: "Man of Athens, dost thou count my happiness as nothing?" "In truth," replied Solon, "I count no man happy until his death, for no man can know what the gods may have in store for him."

And there was indeed great misfortune in store for Croesus. Cyrus the Great of Persia, extending his vast domains, was soon threatening the kingdom of Lydia. Croesus consulted the famous oracle of Delphi in Greece, and, according to the legend, the oracle gave this response: "If Croesus goes to war he will destroy a great empire." So Croesus went out to meet the army of Cyrus and was utterly defeated. He had indeed destroyed a great empire, but it was his own.

The old story goes on to relate that when Croesus was placed on a pyre before the eyes of his savage conqueror and saw the flames creeping upward to consume him, he remembered the words of the wise Solon and cried out, "O Solon! Solon! Solon!" Cyrus was so moved when he heard the story of how Solon had warned the proud king that he ordered Croesus to be released and took him under his special favor and protection.

Crompton, Samuel (1753–1827). Crompton was the third in point of time of the English inventors who, in the latter half of the 18th century, raised the art of spinning from the operation of the primitive spinning wheel to the complicated power machinery processes of the cloth mills of today. Crompton, like the other two, Hargreaves and Arkwright, was poor and a native of Lancashire, England. By the death of his father he was left the main support of the family at the age of 16, and became a yarn spinner. He inherited energy, ambition, courage, and perseverence from his mother, and after his days of toil tramped to Bolton to attend night school.

The yarn produced by Hargreaves' spinning jenny was too coarse and rough for fine grades of cloth, and the boy Crompton set about the task of overcoming these defects. For ten years he earned a scanty living by day, and by night worked at his invention, which he was obliged to guard from his suspicious neighbors. Angry mobs at times threatened to destroy it. With no money to pay the fees for a patent or to secure legal advice, he was cheated out of his rights by manufacturers with whom he made contracts for the use of his invention.

It was 20 years before Crompton had the means to set up a small factory in Bolton, and by that time thousands of his spinning machines were in use, with no profit to himself. He called his machine the "spinning mule," because it was a "hybrid" combining the principles of Hargreaves' "jenny" and Arkwright's "roller frame." It produced a finer, smoother, and more elastic yarn, so Crompton's invention in the end displaced the other. With minor improvements it is used in every textile mill in the world today. Yet all his life this brave genius and world benefactor, whose genius had made wealth for many lesser men, was in needy circumstances. Parliament's tardy grant (in 1812) of $25,000 was lost in unlucky business ventures. He died in 1827 at the age of 74 in very straitened circumstances. (*See* Arkwright, Richard; Hargreaves, James; Spinning and Weaving.)

When PURITAN IRONSIDES *Ruled* BRITAIN

The Story of the Great-Souled Leader who Overthrew the English King and Struck a Mighty Blow for Liberty — His Immense Power Built up with the Bible and the Sword

OLIVER CROMWELL
Puritan Soldier and Statesman

CROMWELL, Oliver (1599-1658). One of the most remarkable characters in English history, Oliver Cromwell struck a blow at tyranny, both royal and ecclesiastical, from which it never wholly recovered.

Born in 1599, little is known of Cromwell's early life except that he was brought up comfortably in the country and in time was sent to the University of Cambridge. He had, however, but a short time for study, as his father died soon after he entered college and Oliver returned to his home in eastern England, where he was busily and usefully employed in looking after the tilling of his fields and the rearing of cattle. In 1628 he was elected to Parliament, where he was known as a rather uncouth figure, active and determined, but chiefly notable for his Puritan religious fervor.

When all hope of reconciliation between Charles I and Parliament failed, in 1642, Cromwell was among the first to offer to aid Parliament in defending its rights. He returned to his home and at once set about raising, equipping, and drilling a regiment of horse. The Bible was an important part of their equipment, for Cromwell would accept only God-fearing, determined men; but they might belong to any Protestant church, only Roman Catholics being excluded. This toleration of religious beliefs other than his own, very unusual for the times, characterized Cromwell's policy all through his public life. Thus organized, his regiment became famous as Cromwell's "Ironsides."

The worth of the Ironsides was first proved at Marston Moor (July 2, 1644), near York. Prince Rupert, the most dashing royalist commander, drove the right wing of the Parliamentarians before him; but Cromwell and the Scots restored the balance on the left and won the battle. "We never charged," he piously wrote, "but we routed the enemy. God made them as stubble to our swords."

As the civil war progressed Cromwell had gradually become the second in command of the English Parliamentary army. He now led a movement which brought about a reorganization of that army on the model of his own Ironsides, and with this force he crushed the king's forces in the famous battle of Naseby (June 14, 1645). King Charles was left practically without an organized army, and in May 1646, he was obliged to surrender to the Scots, who handed him over to Parliament.

In the negotiations which followed the king's capture and the second civil war (led chiefly by the Scots), the army gradually came to feel that Charles, because of his absolute untrustworthiness, must be put to death. Cromwell himself was finally won over to this belief, and he became the chief agent in carrying through, under the authority of the "Rump" Parliament, the trial, condemnation, and execution of the king (1649). Again, when a republic called the "Commonwealth" was proclaimed by the Rump, and the Irish and Scots resisted its authority, it was Cromwell, now commander-in-chief of the army, who compelled their submission (storming of Drogheda,

HOW CROMWELL SOLVED A LEGAL DIFFICULTY

No election had been held in England for 13 years. The scanty remnant of the Long Parliament, mockingly called the "Rump," refused to relinquish its power, relying upon a law agreed to by King Charles I that the Long Parliament should not be dissolved without its own consent. Cromwell, who was commander of the Parliamentary army, became impatient with the dishonest efforts of the Rump to shape the law for a new election so as to prolong its own power. On April 20, 1653, he called in his troops and cried: "Come, come! We have had enough of this." And he bade his soldiers clear the house. At the moment pictured here, one of his lieutenants has laid hands on the mace, the symbol of parliamentary power. "Take it away," commanded Cromwell. When the hall was cleared, he locked the doors and put the key in his pocket.

1649; battle of Dunbar, 1650). And when the Rump Parliament fell out with the army, it was again Cromwell who took the decisive step of dismissing the Rump Parliament itself (1653). Not long thereafter Cromwell accepted the executive power from the hands of the army, with the title of "Lord Protector."

As Lord Protector, Cromwell supported by the army successfully governed England, Scotland, and Ireland for five years. He enforced law and order, granted toleration to all Protestants, initiated many reforms, and increased English sea power. Royalists were excluded from his Parliament, but radicals (called "Levellers") and theoretical republicans caused him much trouble. On Sept. 3, 1658—the anniversary of his victories in 1650 over the Scots at Dunbar, and in 1651 over young Charles II at Worcester—he died peacefully in his bed. His office passed for a few brief months to his son Richard Cromwell, who lacked his father's force and genius.

Cromwell's reforms were not destined long to outlive him. In large part they were swept away when the throne two years later was given back to the Stuarts in the person of Charles II. Yet Cromwell had not lived in vain. He had caused the defeat and execution of a tyrannical king and had shown the practical value of religious toleration. Along both these lines the significance of his work was not lost upon the English people.

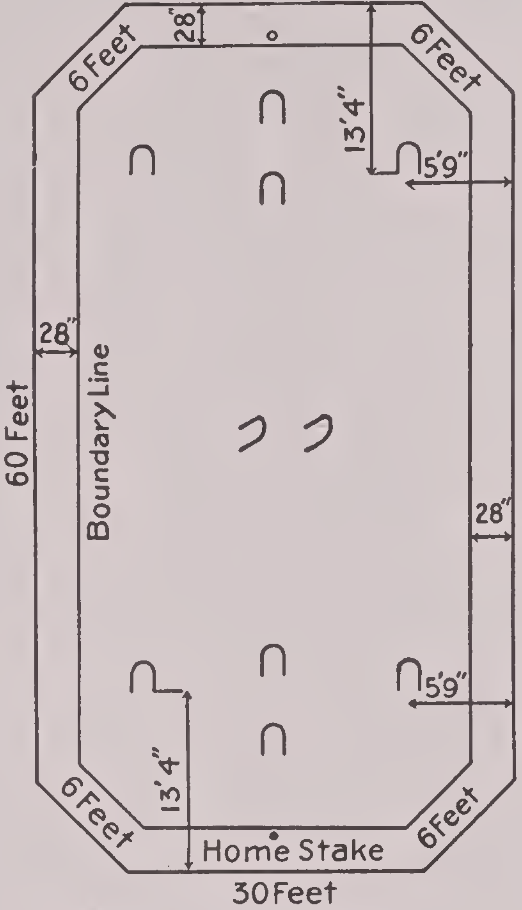
The man who had thus risen from obscurity to the first place in the land was in appearance imposing rather than handsome, very simple and human in his bearing, with a personality made up of contrasted traits. He was at once daring and cautious, hesitant in council and decisive in action. A Puritan enthusiast in religion, he was intensely practical in his military and state policy. He was far from being, as his enemies have charged, a "morose and gloomy" ascetic, for he smoked tobacco, drank wine and beer, hunted, hawked, loved horses, and played "bowls" even after he became Lord Protector. He was fond of music and scandalized the stricter of his Puritan followers by allowing "mixed dancing" at the wedding of his daughter. Yet this lighter side only appeared at moments in his intensely purposeful life.

He had an unswerving trust in God and he absolutely accepted every victory which he gained in war or politics as a manifestation of divine providence. In his last prayer he gave thanks that he had been "a mean instrument to do God's people some good and God some service." Though often abrupt and arbitrary, his aims were lofty and disinterested. The final verdict pronounced on him by a close associate was a just one: "A larger soul, I think, hath seldom dwelt in a house of clay."

CROQUET AND ROQUE. Croquet was played first in France, where it was known as *paille-maille.* It was imported into England as "pall-mall" and gave its name to a famous London street. But in spite of its popularity among the British, croquet never became a highly skilful game until it was developed in the United States under the name of "roque" (*rōk*). This form of the pastime is gaining popularity every year among Americans and most large cities now have roque courts in their public parks.

A description of roque will cover all the essential points of croquet. The four corners of a regulation roque court are cut off by angle lines so that the court has eight sides. Around these sides a heavy wooden or concrete wall or curb is built about six inches high. The surface of the court is made of concrete or of hard-rolled earth. Ten wickets or arches of heavy steel are set into this surface, four distributed at each end and two in the middle. The opening under these arches is 3½ inches wide, except the two center arches, which are only 3⅜ inches in width.

PLAN OF ROQUE COURT



This diagram shows you the relative dimensions of the court. The measurements may vary slightly, provided the same proportions are retained.

The game is usually played by two persons, each using a wooden mallet and two balls made of vulcanized rubber, 3¼ inches in diameter. The object of the game is for each player to drive his two balls in succession through the ten arches and return to the starting point. At each end of the court are short wooden pegs, and the peg at the starting point must be struck by both balls on their return to complete the game. The peg at the opposite end is struck midway in the course. The players take turns; as soon as one misses a shot, the other takes up the play.

The narrowness of the arches compared to the size of the balls makes roque much more difficult than croquet. The other chief difference is that the curbing which surrounds the court gives the players opportunities to make "carom shots" against the curb as in billiards and reach positions by rebounding which they could not attain in a straight shot.

A successful shot consists either in driving a ball through one of the arches or in driving it against one of the other three balls on the court. In the latter case the player is entitled to two successive shots. After failing in a shot with one ball, the player, when his turn next comes must use his other ball.

The mallets used in roque have shorter handles than in croquet. Their usual dimensions are: length of handle, 10 inches; length of head, 7½ inches; diameter of head, 2 or 2¼ inches. The striking faces are made of ivory or hard rubber on one end and of soft rubber on the other. This soft rubber face is used in making curve shots, by imparting a spinning motion to the ball.

In a broad sense, roque very much resembles large-scale billiards, and it develops a degree of skill and accuracy almost as great. The National Roque Association was organized in New York in 1882, under the name of the American Croquet Association, which name was soon changed to the present one. Clubs exist all over the country, and annual tournaments of the association are held in one or the other of the many cities which have local clubs. Rules for playing the game are issued by the association and may be found in any public library.

CROW. The crow's worst enemy admits that he is clever, probably more so than any other member of the bird family. In his wild state he keeps the farmer busy planning "scarecrows" to keep him out of the cornfields, and one tame crow can disturb a whole community. He is an American citizen and claims as his domain the temperate region north of Florida to the Arctic coast, and west to the arid plains.

With jays, ravens, and magpies, the crow belongs to the family *Corvidae.* He is about 20 inches in length and his glossy plumage justifies the adage "as black as a crow." His appetite is his weakness. Not satisfied with fruits, seeds, toads, frogs, and small snakes, he robs fields of newly sprouting corn, birds' nests of their eggs, and even eats young chickens.

Crows mate early in spring and build a large stick nest in a tall tree. While the female sits on the spotted blue-green eggs, the male provides her with food. Young crows eat ravenously and the ingenuity of both parent birds is taxed to the uttermost to satisfy the food demands of their family. Crows do not migrate, but in winter often several thousand will roost at some common center, scattering each morning to their various feeding grounds.

No wild bird taken into captivity has more readily accommodated itself to domestic life or furnished more interesting entertainment for its captors. A born thief in his wild state, when tamed he becomes a veritable kleptomaniac. He pilfers all sorts of eatable and uneatable objects, bright trinkets proving irresistible to him. Tamed crows, whose tongues have been slit, have been taught to speak several words and seem to use them intelligently. Once they are accustomed to a household, crows need not be caged.

The fish-crow is smaller than the common crow and feeds largely on such water creatures as die and float ashore. He is a great egg-eater and is a constant menace in the heron and ibis rookeries. The Florida and western crows are smaller forms of the common crow. Scientific name, *Corvus brachyrhynchos.*

The True Story of JIMMY, A Tame Crow

LIKE other crows Jimmy had a humble origin, but from the day when he hatched out of a green egg, in a crude nest overlooking the city dump, he achieved distinction, fame, and satiety. Two weeks he lived in his natal home, tormented by hunger, wishing always that something would happen to his two little brothers so that he could for once get a square meal.

Jimmy then lived in a box, and as long as he was fed to overflowing every 10 or 15 minutes, he was very good and quiet, lying asleep on his bed of straw or feebly blinking his pale blue eyes. At any sound, however, he sprang into life like a Jack-in-the-box, neck stretched, cavernous mouth wide open and yelling, every sheathed feather seeming to stand on end against the pinkish background of his body. It was a problem to keep him quiet. Bread and milk in however large quantities was not sufficient. He needed some animal food, so we decided on worms. But digging worms to fill this bottomless pit was an all day job. It was easier to pull them at night when his mistress could catch a couple of hundred of the large fat night crawlers at a time.

Jimmy's Adventure with the Ants

Jimmy's first summer with his foster parents was one of rural contentment. He loved to pick beans and peas or puncture an occasional tomato or sit affectionately upon his master's foot while he hoed. If Jimmy was a nuisance in the garden he was funny enough to keep us good natured. One day in the garden an ant's nest was overturned; the tiny red creatures scurried about frantically carrying their white pupae to safety. The effect of this on Jimmy was most curious, for he seemed to be thrown into a sort of delirium by the seething mass. He rushed into the thickest part, ruffling out his feathers and rubbing his head into them. The ants were fast penetrating his plumage and apparently biting him, but, although he was obviously annoyed by it, he continued to rush back at the ants whenever we forced him away. Finally his mistress had to lock him up to recover and rid his fretted body of ants. This he did by drawing his feathers through his bill, but he never ate the ants. Smoke at first had a very similar effect on him and whenever anything was burned in the yard someone had to stand guard to keep Jimmy from rushing into the fire. Finally he seemed to learn to be afraid of fire and kept away.

"A dog—a noisy clumsy puppy whom Jimmy feared and bitterly detested."

If Jimmy was fascinated by the garden he was also very partial to the kitchen, where he stood a fair chance of getting into the butter or some other delicacy. One day he jumped into a pan of hot fudge, and for a week after he was busy picking fudge off his legs and breast feathers. Often his mistress heard unaccountable sounds in various parts of the house, and upon investigation found Jimmy pompously helping himself from dressing table or sewing basket. Pulling hairpins and toying with rings and bracelets was particular sport to Jimmy. While harmless enough with the family, he was apt to be troublesome, for one day while a friend was amusing him with her gold bracelet he deftly snatched it and carried it to the top of a tree.

How Jimmy Fell Out with the Dog

But this perfect happiness was fated soon to end. Jim's master and mistress, with a complete lack of regard for Jim's feelings in the matter, took unto themselves a dog—a noisy, clumsy puppy, whom Jimmy feared and bitterly detested. Although he had been their constant companion from May to September, even following them for miles on field trips, he now suddenly changed and with a thousand imprecations against the dog and household he left home and entered upon a checkered career.

After some days his mistress learned that her baby crow was hanging around a saloon. Apparently Jimmy was getting a bad start in life. They repeatedly brought him home, but as long as they had the dog they could not keep him without caging him. He wandered farther and farther, seeking always man in preference to his own kind, and had it not been for the little aluminum band of the American Bird Banding Association on his leg his mistress might have lost track of him altogether.

Here is Jimmy in mischief again, pulling hairpins out of a girl's hair. But she doesn't seem to mind it, for Jimmy is only doing it in fun.

Jim made both friends and enemies. On one of his first outings he flew up to the upper floor of a suburban home and tapped on the window. The occupants thought it strange but very nice to have a crow come to their window, and welcomed him by opening it. Without a sound Jimmy flew over to the bathtub (for it happened to be the bathroom), grabbed a cake of soap, and triumphantly flew out again. He always had a liking for soap, probably on account of its fatty material, for Jim's early diet was lacking in fats. Butter and cheese too, were a great delight to him.

More brazen than stealing soap were his pranks at the neighbors. The summer that Jimmy was a year old he learned the joy of pulling up young plants in the garden. The destruction of beans and peas was tolerated for a while; but when he practiced his new trick on strawberry plants, the neighbors rebelled and Jim's mistress had to keep him home.

Jimmy Turns Out to be a Mouser!

One day as she was comforting him for being locked up, he stopped suddenly in his affectionate crooning and pounced upon something behind an overturned bucket. When he returned to the perch she saw that he had caught a mouse in his bill, not using his claws as does a hawk. Having learned the trick, Jimmy liked catching mice for himself in his pen in the barn and even after he had his freedom again he caught mice and shrews in the open.

It was not until Jimmy was released in the spring that he acquired the ability to make wordlike sounds. Most birds do not learn to sing until they are a year old and doubtless Jimmy now gained the necessary control over his vocal muscles. At this time the family was away from home, and Jimmy lived mostly with the school children and soon began imitating many of their words. When the family returned, he greeted them with "Hello," "How d'y do," "Mamma," "Papa," and many other articulate sounds. So familiar was Jimmy with the schoolboy lingo that he often fooled the teachers. One day he perched on the window sill of a school room and said "Hullo! Hullo!" in a conversational tone, and a boy in the back seat was reprimanded for being a nuisance. Just then Jimmy flew over to the blackboard and began throwing chalk on the floor. When the teacher tried to stop him, he pecked her fingers and flew up on the door and gave forth an awful scolding, to the great amusement of the children. Another of Jim's accomplishments was a high pitched almost musical "*Hoo*-oo, *Hoo*-oo," such as little schoolgirls use in calling to one another.

Why Jimmy Disliked Boys

Next to dogs, he hated newsboys with a lasting and virulent animosity. Perhaps he hated all small boys for the drooping wing he received at the hands of one. At any rate he would not permit a boy to approach without an irate volley of abuse, accompanied by flying at the intruder's head and pecking his ankles. Unfortunately the boys failed to see the funny side of their plight, and their nervousness was much relished by Jim. If after hedging and dodging the boy successfully conveyed the paper to the door, Jimmy would relent somewhat and permit him to leave, but not without accompanying him off the premises.

"He would not permit a boy to approach without an irate volley of abuse, accompanied by flying at the intruder's head and pecking at his ankles."

Swaying from side to side and dragging his wings, he would walk stiff-legged after the boy, jabbing his fast retreating legs.

For over two years Jimmy survived his ups and downs, hunting his living, fighting his enemies, learning that life is sweet but perilous. Much of the time he lived as a wild crow, but without the advantage of a wild crow's wariness. The local game warden was once on the point of ending Jim's mischief forever when Jim saved himself by flying down on his shoulder with a lusty "Papa"; and this was not the only time that by a timely guffaw he saved himself from a bullet. But one unlucky day, Jim's wanderings took him to a game farm several miles from home. With his usual fearlessness he approached too near to one of the keepers, and this time Fate overtook him, for a gun suddenly popped and Jimmy's checkered career was ended. All who really knew Jimmy mourned his death.

When CHRISTIAN FOUGHT INFIDEL *for* PALESTINE

SPLENDID heroism, religious self-sacrifice, and Christian devotion—these light up with an ever-memorable refulgence those vivid dramas of the Age of Faith which we name the Crusades. In one aspect they are merely a new phase of the age-long conflict of East and West—of Europe and Asia; in another they anticipate the outburst of colonizing and commercial expansion which characterizes the modern world. At the beginning of the Crusades Christian Constantinople and Mohammedan Bagdad as much excelled western Europe in orderly civilization as Europe did barbaric America in the days of Columbus, and every journey had its lessons of wonder. From whatever standpoint we view them, the Crusades are the central point of the Middle Ages, ending the period of the Dark Ages, and leading on to the flowering of western Europe in the Renaissance of Art and Learning.

CRUSADES. When the fierce Seljukian Turks captured Jerusalem from the tolerant Saracens, in 1071, they began a cruel persecution of the Christians who were among the inhabitants of the land. Pilgrims on their way to the Holy City were attacked, robbed, and beaten. The sacred places of the church were profaned or destroyed. To the Christians of Europe, Jerusalem was a holy spot. The tomb of Christ, the Mount of Olives, Golgotha, and all places and things associated with the life and death of Christ were so sacred that they were believed to possess divine powers of healing and forgiveness. So when news of the capture of Jerusalem came to Europe, great excitement and indignation were felt. The eastern Emperor Alexius, whose predecessor had been defeated and slain by the Saljukians, feared for the safety of Constantinople itself, and sent an appeal for assistance to Pope Urban II at Rome. A council was called at Clermont in France, in 1095, and there the pope made an eloquent speech, urging his hearers to undertake a crusade to rescue the Holy Land. No speech in history has ever had greater results. Fired with religious zeal, clergy, knights, and people cried, "God wills it!" and pressed forward to offer their swords to the cause. On their breasts as they went, and on their backs as they returned, they wore a cross (in Latin, *crux*) of blood-red cloth, from which comes their name, "crusaders."

Preparations were immediately begun for the long difficult journey to Jerusalem, which we call the First Crusade (1096–99). Many of the common people were so deeply stirred that they were unwilling to wait until the time set by the council for the beginning of the crusade. At least four separate bands started for the East in the spring of 1096. A knight named Walter the Penniless successfully led a large number of crusaders to Constantinople. Another company under the leadership of a monk named Peter the Hermit was not so fortunate. Wholly unprepared for a journey of over two thousand miles, the history of their struggle to the east is one of hardship, starvation, and death. More than half perished or were taken as slaves as they passed through Bulgaria, and few of the many thousands who started under such leadership lived to see the Holy Sepulcher.

In August 1096 the first real armies of knights and princes began their march towards Palestine. They were in four main companies, under such famous leaders as Godfrey of Bouillon, Robert of Normandy, Raymond of Toulouse, and Bohemond the Norman, son of Robert Guiscard of Sicily. After varying fortunes the crusaders reached Constantinople, and after some delay, moved on towards Jerusalem. After a trying and dangerous march across Asia Minor, the crusaders came at last within sight of the city of Antioch, with its hundreds of towers. For seven months the siege of the city dragged on; besiegers suffered almost as much as the besieged. The winter rains deluged the camp and famine forced them to eat thistles and dead animals. At last the city was captured. But the sufferings of the crusaders did not end. Disease rapidly thinned their ranks, despair led to loss of courage and discipline; and when they themselves were besieged by an army under the Seljukian sultan, the outlook seemed almost hopeless.

The situation was saved in a strange manner. A priest among them, Peter Barthelemy, announced to the leaders of the army that he had seen in a dream, thrice repeated, the head of the lance which had pierced the side of the Savior. It was hidden under the high altar of the church, and if found would bring victory to the Christians. Although many were skeptical, search was made and Peter himself found the spear. So great was the enthusiasm aroused by this discovery—whether real or feigned—that the crusaders attacked the Turks with fanatical valor and utterly routed them.

The crusaders stayed in Antioch six months. Many of them had been killed, some had perished from hardships in the long marches, thousands died from the plague. When in June they set out for Jerusalem, only a few thousand of the original hundreds of thousands remained alive. But the hardships and despair of the long march were forgotten when they crossed the last hill, and saw the Holy City before them. Stretching out their arms, they fell on their knees and kissed the ground, while a shout went up on all sides, "Jerusalem, Jerusalem!"

After several weeks of fighting the city was taken. There followed in the streets where the gentle Christ had walked a massacre such as the Turk had not been guilty of in his fiercest moments. Blood flowed in streams, and the bodies of the dead lay thick along the public ways. After the slaughter, the crusaders walked barefooted and bareheaded, and knelt at the Holy Sepulcher.

Most of the crusaders soon returned to their homes. Those who remained in the Holy Land were presently joined by new companies of crusaders who were constantly arriving from Europe. Godfrey was chosen ruler, with the title Defender of the Holy Sepulcher. Legend says he refused the crown and title of king, saying "he would never wear a crown of gold where his Savior had worn a crown of thorns." Castles were built and special orders of knighthood were formed to protect the Holy Land. Chief among these were the Knights Hospitalers, the Knights Templars, and the Teutonic Order (*see* Crusading Orders).

The Second Crusade (1147–49) came 50 years after the first and was one of the greatest failures of history. It was preached by the famous French monk, St. Bernard of Clairvaux. He refused the leadership of the expedition, and under Conrad III of Germany and Louis VII of France it was so mismanaged that it accomplished nothing.

RICHARD THE LION-HEARTED ASSAULTS JOPPA

England's famous Crusader leads his Knights to the attack in the battle which gave the Mohammedan stronghold to the Christian forces.

After another 40 years (1187) Jerusalem was taken from the Christians by Saladin, one of the greatest rulers the Mohammedans ever had (*see* Saladin). He was wise in counsel, brave in battle, and as chivalrous in conduct and sincere in his faith as the best of his Christian foes. When Saladin captured the Holy City there was no massacre of captives, as there had been when the crusaders had defeated the Turks. Instead, the greater number of the defeated were allowed to go free on paying a ransom.

Saladin's conquest gave rise to the Third Crusade (1189–91). This was led by the aged emperor of Germany, Frederick Barbarossa (so called from his red beard), Philip the Fair of France, and Richard the Lion-Hearted of England. Frederick, although he was 70 years old, led his army with ability and all went well with the Germans until the old Emperor was drowned in a mountain stream in Asia Minor. The German expedition then fell apart. In later centuries many of the German people refused to believe the Emperor was dead. They told stories of a lonely cave far up on the mountain side where he slept the long years through, his head resting on his hand, the long red beard growing out among the rocks.

Richard of England and Philip of France, instead of taking the old land route down the Danube valley, went from France in ships by way of the Mediterranean. When they reached the Holy Land they found the Christians besieging Acre. After a weary siege of 23 months, the city was taken; but Philip and Richard quarreled, and Philip soon returned to France. Richard remained in Palestine to wage a hopeless war. Some time later he too left the Holy Land, and after exciting adventures finally reached England. But before leaving Palestine Richard made a treaty with Saladin which permitted Christian pilgrims to visit the Holy Sepulcher without being molested.

ST. BERNARD ROUSES WESTERN EUROPE TO CRUSADING ZEAL

When word came from Palestine that Jerusalem, captured for the Christians by the First Crusade, was again in danger, the forces of Christendom sprang to arms. The pope commissioned St. Bernard of Clairvaux to preach a Crusade, and Bernard's burning eloquence secured large forces for the effort. This Second Crusade, however, turned out to be a complete failure, for lack of good military leaders.

The remaining crusades are not important. The Fourth (1202–1204) never went near Palestine, but instead attacked the Christian city of Constantinople, and there founded a "Latin Empire" in place of the Greek, which lasted about half a century. The Children's Crusade, which took place in 1212, was one of the strangest happenings in history. An army of French children, headed by a peasant-boy named Stephen, set out for the Holy Land by way of Marseilles. A like army of German children, led by a boy named Nicholas, crossed the Alps at Mont Cenis, while a second army of German children crossed the Alps by a more easterly route. They believed that the Mediterranean would open a path for them to Palestine and that by miracles Jerusalem would be recovered and the Moslems made Christians. Some of the children became discouraged and returned to their homes and many were stopped by the way; but most either perished on the march, or were lost at sea or sold into slavery.

On the Fifth Crusade (1228–1229) Frederick II of Sicily, emperor of Germany, secured Jerusalem by negotiating with the Mohammedans, who were now weakened by divisions. In 1244 however a new horde of Turks made themselves masters of Jerusalem. A Sixth Crusade (1249) followed, led by Louis IX of France against Egypt, now held to be the key to Palestine. The saintly king Louis was taken prisoner, and was obliged to pay a heavy ransom. The Seventh Crusade (1270) was again led by St. Louis of France, and by Prince Edward, afterward Edward I of England. The French king died of the plague, and nothing was accomplished by this adventure. Acre, Antioch, and Tripoli were held by the Templars and other crusading knights for some time; but Acre, followed by the others, surrendered in 1291.

With this event was lost the last Christian stronghold in the Holy Land. The period of the Crusades was at an end, for thenceforth the problems at home were such as to keep the princes from such profitless expeditions. Not until General Allenby and the British-Arabian army captured Jerusalem in 1918 were the holy places again in Christian hands.

The Crusades profoundly affected Europe. In Constantinople and in the lands of the Saracens learning, art, and industries flourished to a degree unknown in Western Europe; and for nearly 200 years bands of crusading pilgrims were coming and going, year by year, from West to East, and back again. They came from their castles and their villages, having seen nothing and more ignorant than the most ignorant of modern peasants. They found themselves suddenly in great cities, in the midst of new countries, in the presence of unfamiliar usages. They walked in new ways, saw new things, listened to new thoughts. Their minds were broadened, and the way was paved for the subtle change in the intellectual atmosphere, beginning in the 14th century, which we call the Renaissance.

The period of the Crusades also saw the introduction of many new products into Europe—sugar cane, buckwheat, rice, garlic; the orange, watermelon, lemon, lime, and apricot; new dyestuffs, cotton goods, damask, satin, and velvet. For the first time since the downfall of the Roman Empire, commerce revived in Western Europe; and cities such as Venice, Pisa, and Genoa grew rich and powerful through transporting crusaders and their supplies, and importing Eastern products. Money became a power, the feudal nobles declined, the kings increased in might, and crusaders freed their serfs to get money or for the good of their souls.

CRUSADING ORDERS. The Knights Templars, who took their name from the location of their headquarters in the so-called Temple of Solomon in Jerusalem, were the third of the three great military and religious orders which arose from the Crusades. This order was founded in the latter part of the 12th century, to protect the many pilgrims who came to the Holy Land after the first Crusade. The two other orders—the Hospitalers (Order of the Hospital of St. John of Jerusalem) and the Teutonic Order—were organized at first to provide hospitals and care for sick and wounded crusaders. The members of all three orders were knights skilled in fighting, and at the same time the full members were bound as individuals by the monastic vows of perpetual Poverty, Chastity, and Obedience. In the Holy Land they constituted a sort of permanent garrison to hold the conquests won by the separate Crusaders.

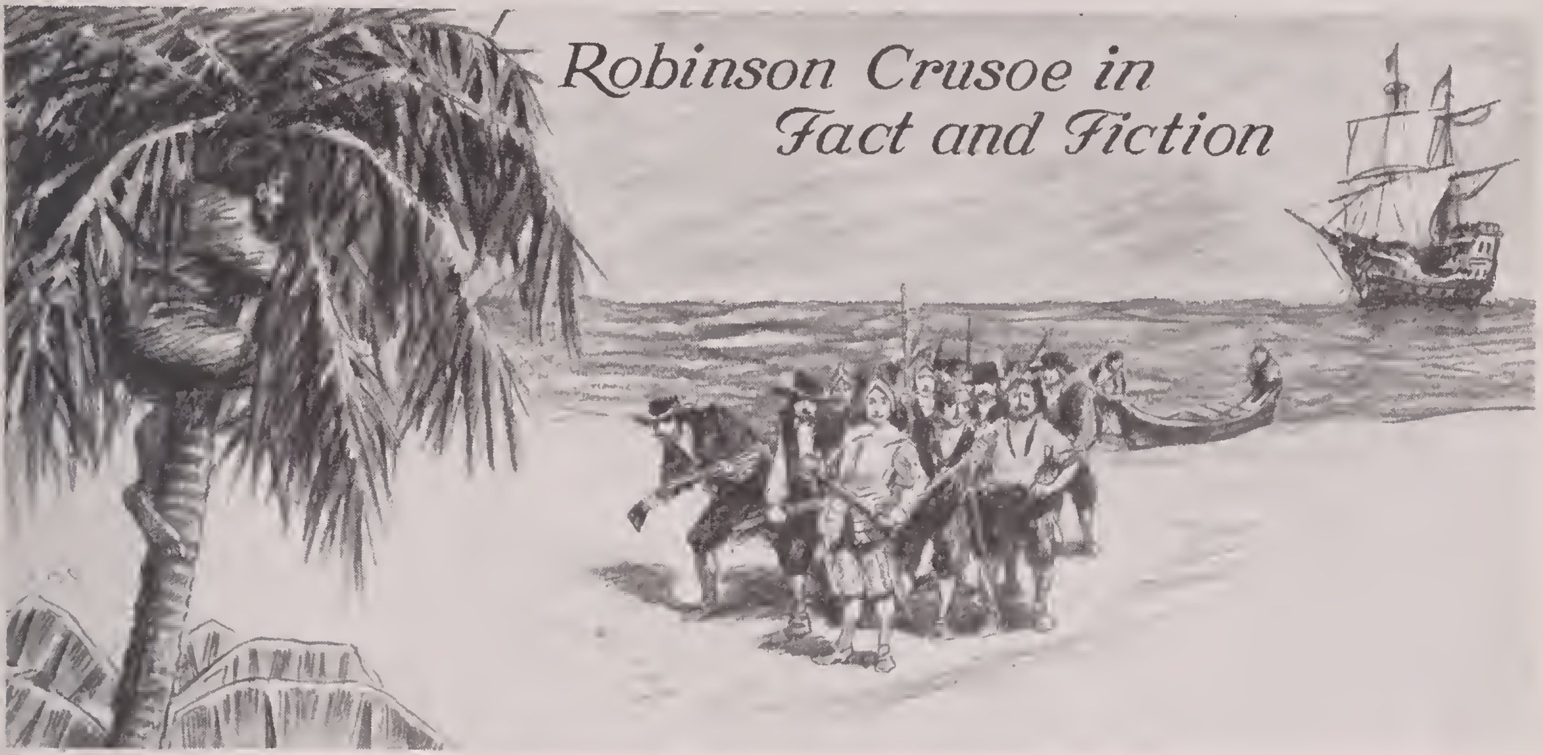
In course of time kings and pious individuals conferred upon the orders power and possessions in many lands, until they became important factors in the history of the world. Their leaders were summoned to the great church councils; their houses (especially the "Temple" or Templars' house in Paris) were used as strongholds for the royal treasure; and upon them kings, when pressed for money, depended for loans.

The wealth, power, and pride of the Templars finally caused their destruction. King Philip IV of France accused the members of heresy and misconduct, and after a farcical trial secured from the pope the suppression of the order in 1312. Most of their lands and goods went to the kings and princes of the different countries.

The Teutonic Order, after the loss of the Holy Land, transferred its activities to Germany, where it conquered Prussia from the Slavic heathen who held it. With the kindred order of the Knights of the Sword it was a chief agent in christianizing the land and colonizing it with Germans. The Teutonic Order was secularized and dissolved at the time of the German Reformation (1525).

The Hospitalers retreated to the island of Rhodes at the close of the crusading period. They maintained themselves there as the Knights of Rhodes until the conquest of the island by the Turks in 1522. The Emperor Charles V then granted them the island of Malta, which they continued to rule until Napoleon seized it in 1798.

Robinson Crusoe in Fact and Fiction



Twice the "real Robinson Crusoe," Alexander Selkirk, had his hopes dashed by finding that approaching ships were Spanish. When their crews landed he hid in a tree in order to avoid capture and imprisonment.

CRUSOE, ROBINSON. We all know the story of Robinson Crusoe, the hero of Daniel Defoe's famous novel—how he was shipwrecked on an uninhabited island, where he had many adventures, particularly with visiting cannibals; how he rescued one of their victims, who became his "Man Friday"; and finally how he was taken off the island by a passing vessel. Few books have been read with more lasting pleasure by young and old alike than this romantic tale. Perhaps you also know that Robinson Crusoe's island is a real island—Juan Fernandez Island—off the coast of Chile, to which it now belongs; and that Defoe's book is based upon the true adventures of a British sailor, named Alexander Selkirk, who lived from 1676 to 1721.

AN HOUR'S FUN WITH POLLY

Selkirk amused himself during his long stay on Juan Fernandez Island by taming goats and parrots.

Selkirk was born in Fifeshire, Scotland, became a sailor and at an early age took part in privateering expeditions to the South Seas, as the Pacific was then called. In 1704, when he was aged 28, he again embarked as sailing master, or mate, of the English vessel *Cinque Ports*. In the course of this voyage he quarreled with the captain of the vessel, and was left, at his own request, on the uninhabited island of Juan Fernandez, in the South Pacific. The leaky condition of the ship, as well as his quarrel with the captain, was the reason for Selkirk's strange request. Before the ship left, Selkirk repented of his rash intent and begged to be taken on board again, but this was refused. After four years and four months of solitude on the island he was discovered and rescued by the British ship *Duke* in January 1709.

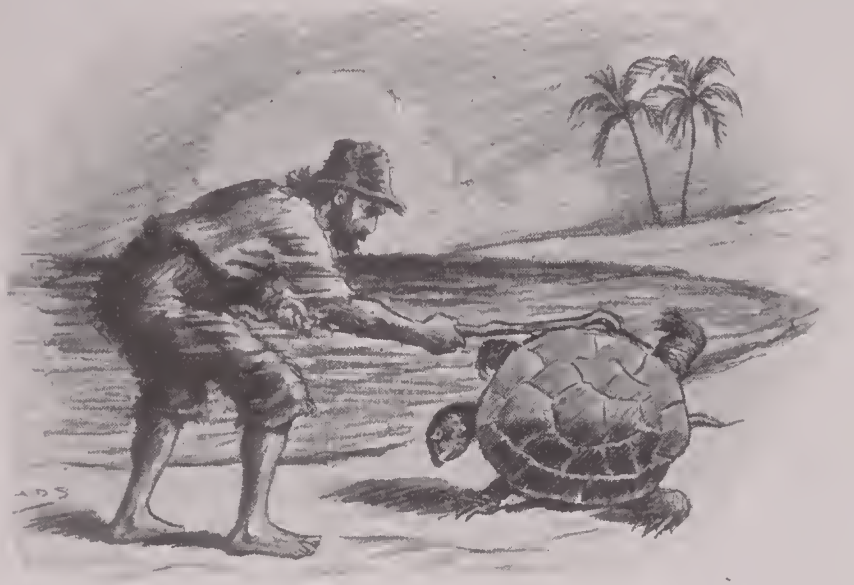
In these four years Selkirk had seen several ships pass by his island. Two had anchored for wood and water, but on discovering that they were Spanish, he had climbed a tall tree rather than fall into their hands. England and Spain were at war, and he feared that he might be killed or sent to work as a prisoner in the mines of South America. When the British vessel *Duke* came to anchor and sent a party ashore for water, they found "a man clothed in goats' skins, who looked wilder than the first owners of them."

The commander of the rescuing vessel, Captain Woodes Rogers, gave an account of Selkirk's adventures in a book entitled 'A Cruising Voyage Round the World', which he published a few years later.

"He had with him," says Captain Rogers in telling how Selkirk was left on his island, "his clothes and bedding, with a firelock, some powder, bullets, and tobacco, a hatchet, a knife, a kettle, a Bible, some practical pieces (useful articles), and his mathematical instruments and books." It was lucky for him that he had his books, for they helped him to fight against lonesomeness and despair. With his tools he built two huts of pimento trees, covering them with grass, and lining them with the skins of wild goats which he slew for food.

After a short time his powder, of which he had only a pound, gave out. For a time he could kill no more game and could make a fire only by rubbing together two dry sticks. He slept only when he could watch no longer, and "never ate until hunger constrained him." He had no salt to season his fish, which were easy enough to catch, and so lived on crayfish, which better pleased his taste. Gradually Selkirk found ways of overcoming his difficulties. He captured great turtles on the beach, and he learned to take the goats by running them down.

HERE WAS TURTLE SOUP FOR MANY DAYS!



Turtles were easy game for Selkirk. He captured them easily by turning them over with a stick.

How Selkirk Outran Goats

"He ran with wonderful swiftness through the woods," said Captain Rogers, "and up the rocks and hills, as we perceived when we employed him to catch goats for us. We had a bull-dog, which we sent with several of our nimblest runners, to help him in catching goats; but he distanced and tired both the dog and the men, caught the goats and brought them to us on his back."

Selkirk's lack of salt was forgotten in the use of the fruit of the pimento tree, and of a black pepper called malageta. Nor did he lack vegetable food. "He had enough of good cabbage from the cabbage-tree," a species of palm, writes the captain.

His clothes wore out very soon. He found that he could get along without shoes, and that goats' skins served for the making of a coat and cap. "Having some linen cloth by him, he sewed himself some shirts with a nail, and stitched them with the worsted of his old stockings, which he pulled out on purpose." Fortunately, Juan Fernandez Island never has very severe weather. There was a little frost and hail in June and July, when it is winter in the Southern Hemisphere, and in summer the heat was never unbearable.

Defoe describes Robinson Crusoe as amusing himself by taming parrots and kids. Alexander Selkirk found his island infested with rats. By feeding and taming the stray cats whose ancestors had been left on the island by visiting ships, he succeeded in keeping down the number of the rats. Captain Rogers tells us that "he likewise tamed some kids, and to divert himself would, now and then, sing and dance with them and his cats." In the adventures of the real Robinson Crusoe there is nothing which corresponds to the visits of the cannibals to the island and the escape and companionship of "Friday."

It is not at all surprising that Alexander Selkirk's strange life should have left its mark on him. He had kept his body healthy and his mind sane by working hard, by running through the woods and up the heights, and by making companions of the animals on his island. But he could scarcely make himself understood by the crew of the ship that rescued him, and he had lost all taste for the food, and particularly for the alcoholic drink, of civilized men.

Alexander Selkirk returned to England in 1711, after serving in command of one of the vessels taken by Captain Rogers as a prize, but again embarked and followed the sea until his death in 1721.

THEY SAID HE COULD RUN DOWN GOATS

The crew which rescued him was astonished by Selkirk's running. They reported that not only could he outrun wild goats and capture them, but that a dog brought from the ship to help in the chase could not keep up with him!

Two accounts of his adventures were published soon after his landing, one the story by Captain Rogers and another by Edward Cooke. Selkirk also wrote an account of his own, and Sir Richard Steele sketched his story in a magazine in 1713. Defoe thus had abundant material on which to draw for his 'Robinson Crusoe'.

In 1868 the officers and crew of the British naval vessel *Topaz* erected a monument to Selkirk at a spot called "Selkirk's Lookout" on Juan Fernandez Island. "Selkirk's Lookout" is high up on a hillside, and from it a magnificent view of the island and surrounding sea may be obtained.

CRYSTALS. Just as a violet seed contains the germ of a beautiful flower waiting for soil and moisture and sunlight to develop it, so most of the world's so-called "dead" substances contain in themselves the possibilities of strange "flowers" we call crystals, which take form as soon as they are given a proper chance. If you watch a window pane on a very cold winter day you will see the "flowers" of water growing upon it in the delicate and shapely designs of frost crystals. Soot certainly has no form or beauty, yet its crystal is the most brilliant of all gems—the hard and glittering diamond.

The commonest crystals are those of sugar and salt. If you dissolve these substances in water the crystals disappear; but as soon as you let the water evaporate, they are formed again. Among other well-known substances which take on crystalline forms are sulphur, camphor, mica, quartz, all the precious stones, the metals, and, in fact, nearly all solid minerals in their natural state.

The most important law of crystals is that each substance has its own particular crystal forms, different from those of any other substance. Yet all the countless forms may be divided into six or seven groups, based upon certain geometrical designs common to each group.

Chemical elements or compounds which are not in crystal form are said to be "amorphous," from Greek words meaning "without shape." Carbon, for instance, may exist in the amorphous form of lampblack or in either of two crystalline forms — diamond or graphite.

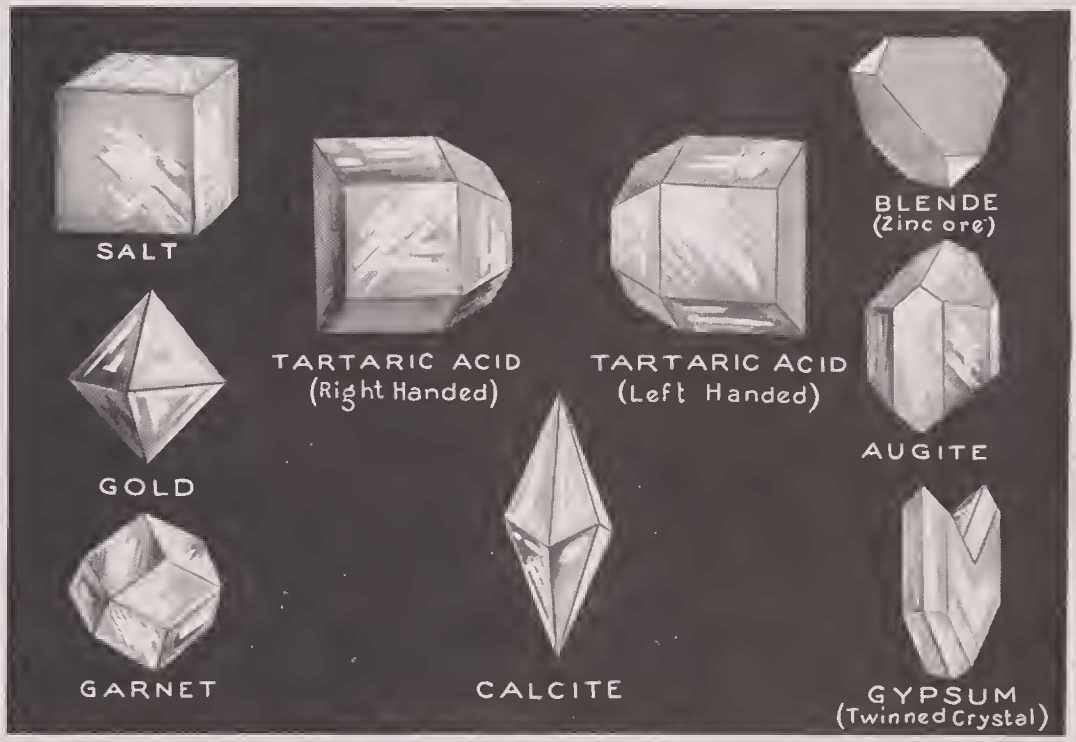
But there is much more than a mere difference of shape between the crystalline and amorphous forms of a substance, or between two crystal forms of the same substance. Each crystal possesses internal peculiarities which persist even when the shape of the crystal is imperfectly formed, as is usually the case in nature. Thus a crystal will expand more in one direction than in another under the influence of heat, and it has running through it "lines of cleavage" along which it will split most readily, as anyone knows who has tried to chip a piece of ice from a large block. Crystals also refract light differently according to the direction in which it passes through them (*see* Light); and certain sugar crystals differ from one another in the fact that one rotates polarized light to the left and the other to the right (*see* Sugar). The power to conduct electricity varies also in different directions. One of the many strange examples of the influence of crystal forms on physical properties is exhibited by the diamond, which is a non-conductor of electricity, while its carbon-brother, graphite, is an excellent conductor.

The study of crystals today centers chiefly about the laws and forces which determine for each substance its own unfailingly regular pattern. Knowing that large crystals are simply combinations of many smaller crystals of the same shape, it is hoped that a study of these forms will shed a more definite light upon the structure of chemical atoms.

While crystals are most commonly formed by deposits of solids from a liquid solution, they may come into being in many other ways. When you bend a bit of wire back and forth, it first changes into a brittle crystalline form, then snaps. The same thing often happens when parts of a machine undergo alternating stresses; this is often the explanation when the frame of an automobile truck snaps.

Crystallography, as the science of crystals is called, has many practical uses. It enables us to identify rock formations in mineralogy and to detect imitation gems. Chemicals are often purified by crystallization. This may be done, for instance, by dissolving a quantity of a chemical in hot water, then allowing the solution to cool. Since cold water will not "hold" as much as hot, a portion of the chemical "crystallizes out," leaving the impurities behind.

SOME BEAUTIFUL CHEMICAL "FLOWERS"



Did you know that the tiny grains of salt you shake on your food are little cubes, and that the gold the miners dig from the hard rock consists of countless tiny 8-sided figures like the one you see here? But there are even stranger things about crystals. Some of them are "twins," and some are "right-handed" and "left-handed." Those two crystals of tartaric acid, for instance, seem exactly alike at first, but a close look will show you that one is the "reverse" of the other, just like the image of itself in a mirror. And the curious thing is that "right-handed" tartaric acid is exactly the same in composition as "left-handed" except for some peculiar internal arrangement, which is responsible for the "reverse" crystals and which makes the two kinds behave differently in many other ways.

The QUEEN of the ANTILLES

Havana, Cuba's Capital, is a City of Broad Avenues and Beautiful Parks

CUBA. Natural wealth and beauty and a strategic position have given this largest and richest island of the West Indies the name of the "Queen of the Antilles." It commands the entrance to the Gulf of Mexico, it helps to hem in the Caribbean Sea, and since the opening of the Panama Canal it guards the chief route of commerce between the Atlantic and the Pacific Oceans.

Cuba is a long narrow island, "curved like a bird's tongue," with a length of 730 miles and a breadth averaging about 50 miles. The total area, including the Isle of Pines and various islets or "keys," is about 44,200 square miles—somewhat less than that of Pennsylvania. The long coast line with its many indentations affords numerous good harbors, of which the chief are Havana, Cienfuegos, and Santiago de Cuba. After the Spanish-American War Guantanamo Bay, on the southern coast, became the chief naval base of the United States in the West Indies.

A low range of mountains, continued by disconnected hills, borders most of the northern coast and adds to the beauty of the scenery. Much of the southern coast is low and swampy, but in the east the majestic range of the Sierra Maestra rises abruptly from the Caribbean and extends from Cape Cruz to the city of Santiago. Many of its peaks exceed 5,000 feet in height, and the highest, Pico Tarquino, is over 8,000 feet. But the general surface of Cuba is a low gently undulating plain.

"Disappearing Rivers" of Cuba

An interesting feature of Cuba is her rivers. Although all but one (the Cauto, with a course of 250 miles) are short, and run directly to the sea, they often drop into caves and pass through tunnels made by the waters. The Moa cascade near Guantanamo is formed by a river which drops 300 feet into a cave. The Jojo river, after disappearing for a portion of its course, reappears at the edge of the sea; and many springs of fresh water which rise through the sea water are supposed to be emerging rivers.

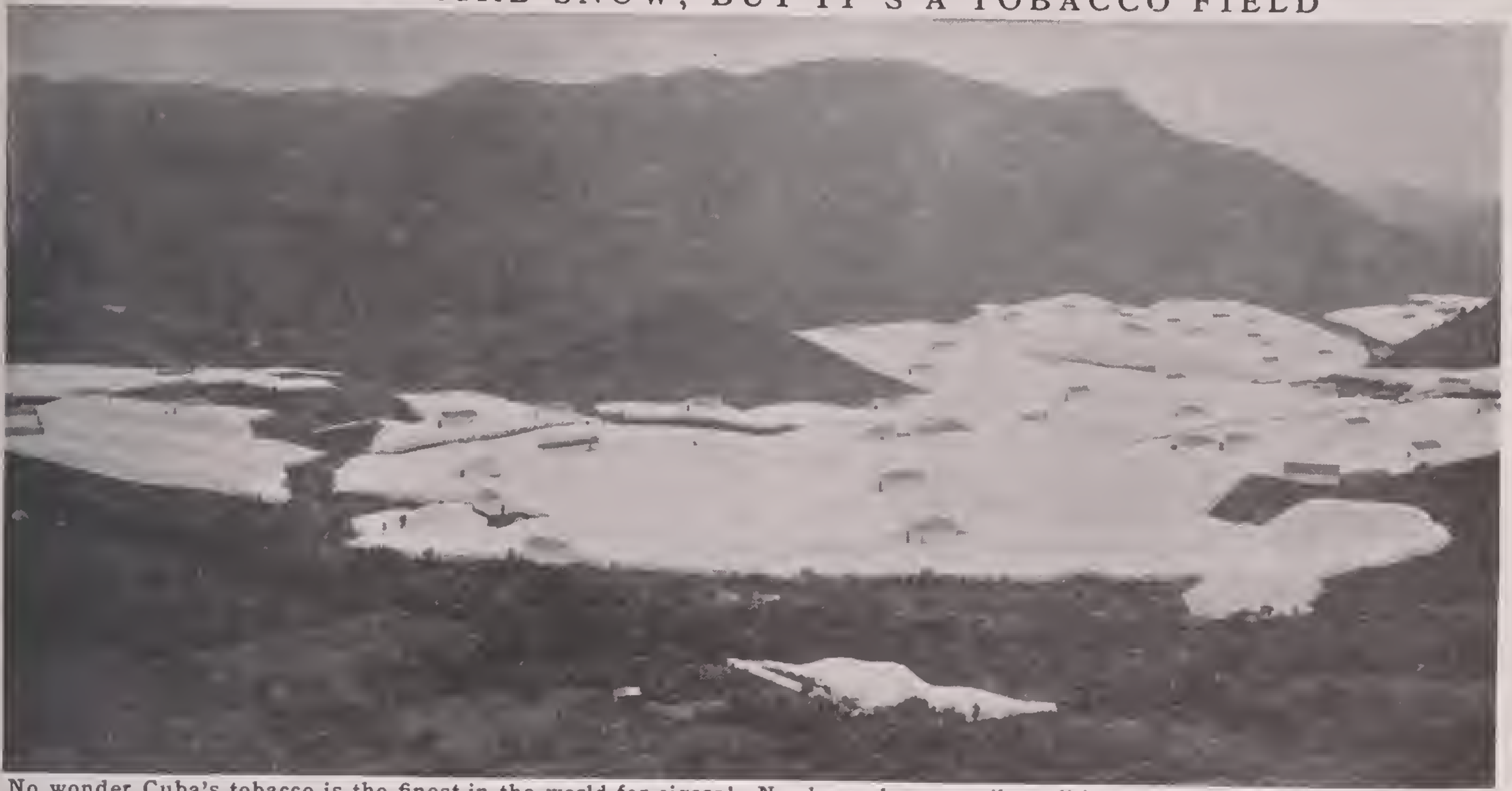
Cuba lies just within the tropics. The humidity is great and rainfall is abundant. Between summer and winter there is only about 10 degrees' difference in average temperature. The island is frequently swept by destructive hurricanes, one of which (in 1846) destroyed nearly 300 vessels and 2,000 houses at Havana, and killed or injured upwards of 1,000 persons. The insanitary conditions which once produced yellow fever and malaria were ended by the American occupation in 1898 and the subsequent efforts of the republic of Cuba.

The natural vegetation is luxuriant and the fertile soil is favorable to agriculture. More than 30 species of palm trees are found. The royal palm, which sometimes reaches a height of 100 feet, furnishes timber for the peasant's hut, thatch for his roof, utensils for his kitchen, as well as medicine and preserved delicacies. Forests of cedar, mahogany, pine, lignum-vitae, ebony, rosewood, logwood, and other valuable woods cover nearly half the island. The banana, which supplies one of the most important foods of the Cuban people, the pineapple, orange, lemon, grapefruit, mango, guava, alligator pear, and many other fruits abound and millions of dollars' worth are exported every year.

Leading Producer of Cane Sugar

Cuba leads the world in the production of cane sugar, over 4,000,000 tons being produced in a single year. Tobacco and its manufacture are another great source of wealth. Among other products are cereals, cotton, coffee, cacao (from which cocoa is made), and market vegetables. The abundance of long grass makes cattle-raising a successful industry. The chief mineral products are iron (of which there are immense

IT LOOKS LIKE SNOW, BUT IT'S A TOBACCO FIELD



No wonder Cuba's tobacco is the finest in the world for cigars! Nowhere else are soil conditions quite as favorable, and growers give the crop the best attention. Here is a field of growing tobacco covered with white cheesecloth to shade the plants and so improve their quality. Next to sugar cane, tobacco is Cuba's most important crop.

deposits), asphalt, manganese, and copper. But these rich resources have been little developed. The greater part of Cuba's trade is with the United States, which gets most of its cane sugar from there.

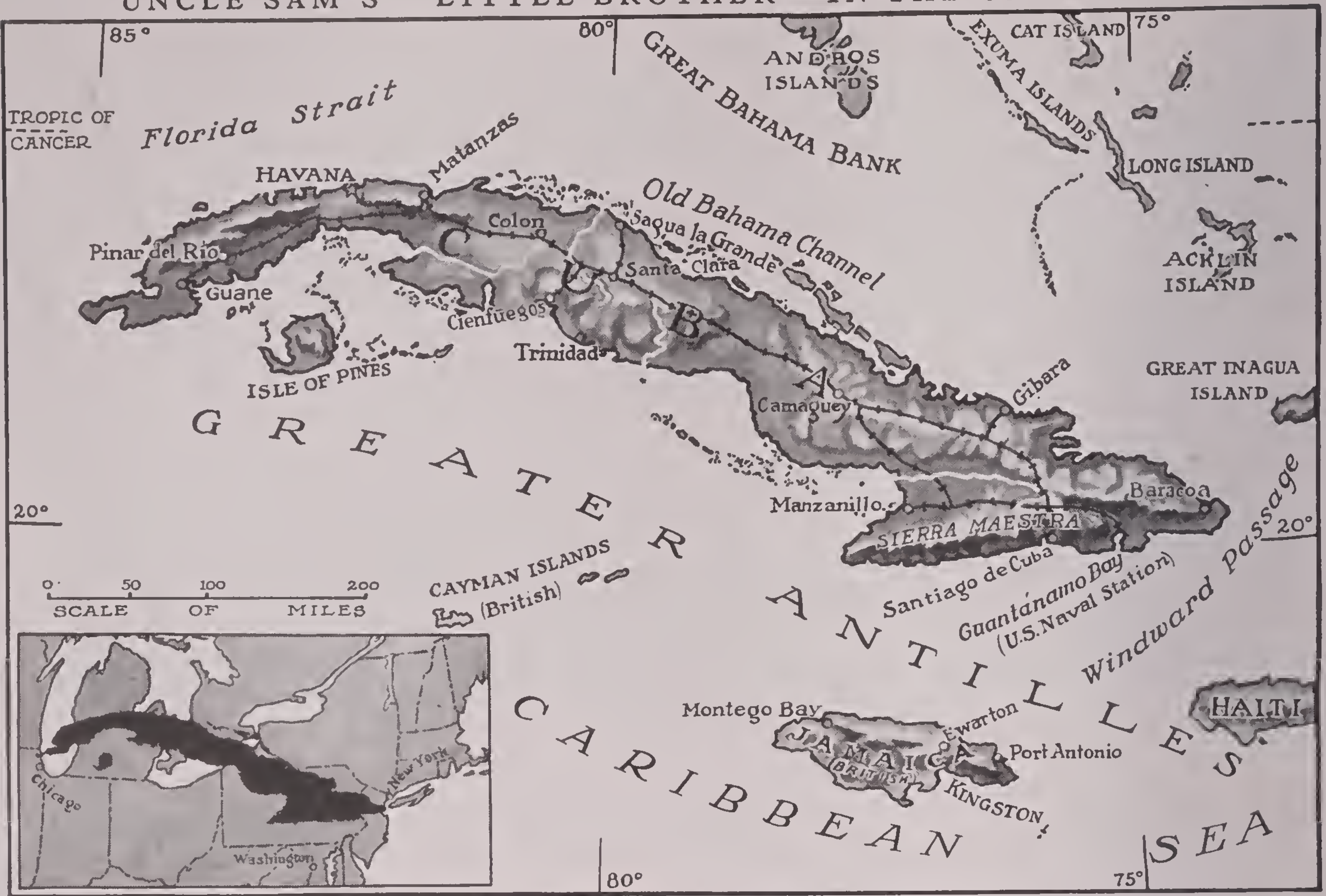
ONE OF CUBA'S "TOY" RAILROADS

This narrow-gage train is winding its way through the Cuban hills with a string of cars destined to carry sugar cane, Cuba's most valuable product. The little cars are especially designed for this work, being open at the top so that they can quickly be loaded.

About 60 per cent of the people are native Cubans, descendants of the Spanish settlers; the remainder are negroes, foreign-born whites, and a few Chinese. In recent years there has been marked development in education, and the number of illiterates is decreasing. At Havana there is a well-equipped university.

Cuba was discovered by Columbus in 1492. The Spanish conquest of the island began in 1511, and within a few years several settlements had been established. The Indians were so nearly exterminated by the Spanish settlers that, when the sugar cane industry was started, African negroes were imported

UNCLE SAM'S "LITTLE BROTHER" IN THE CARIBBEAN



Thanks to the watchfulness and care of the United States, Cuba has become a prosperous nation, producing sugar and tobacco crops of immense value, and serving as a winter playground for thousands of Americans. Its two leading ports, Havana and Santiago, are at opposite ends of the island. The country is tropical and boasts beautiful mountainous regions by way of contrast to its attractive cities. The inset map shows how Cuba would reach from New York to Chicago if it were set down on the United States.

as slaves. Misgovernment was the rule during Cuba's colonial history, and the continued exploitation and oppression led to frequent insurrections. The wars of successful revolt, which swept South and Central America between 1810 and 1825, left Cuba still a Spanish colony. In 1868–1878 came a great outbreak known as the Ten Years' War. In spite of some superficial changes the old oppression continued, and in 1895 the Cubans again revolted; during the war which followed, the cruelties inflicted by the Spaniards led to repeated protests by the United States government.

How Uncle Sam Set Cuba Free

Then in 1898 the United States battleship *Maine* was blown up in the harbor of Havana, supposedly by a submarine mine. Public opinion fastened the blame upon Spain, and war between the United States and Spain was declared April 24, 1898 (*see* Spanish-American War). The treaty of peace, signed the following December, forced Spain to surrender all claim to Cuba and provided for its temporary military occupation by the United States. During the three years that the island was under American military rule, much was done in the way of public works, sanitation, education, etc., to prepare Cuba for self-government. In 1902 the Republic of Cuba was established as an independent nation, the United States, however, reserving the right to intervene when necessary for the preservation of order and of Cuban independence. This right was exercised in 1906 when an insurrection followed a disputed election. Again in 1917, when another revolt occurred, warnings were issued by the United States, but order was restored without actual military intervention.

Cuba demonstrated her gratitude to the United States and her sympathy with American ideals by declaring war on Germany on April 7, 1917, the day after the United States issued its declaration. Four large German steamers were seized and handed over to the United States without compensation. Its government authorized the sending of American troops to Cuba for training, and set about organizing an expeditionary force of 25,000 troops of its own. Population, about 2,900,000.

The government of Cuba is modeled after that of the United States. Executive powers are vested in the president, who with the vice-president is elected by indirect vote every four years, and who is assisted by a cabinet. The legislative power is exercised by a national congress, composed of a senate of 24 members elected by indirect vote for eight years, and a house of representatives elected by direct vote for four years. The capital and largest city is Havana, with a population of about 360,000. Camaguey comes next (95,000), then Cienfuegos (82,000), Santiago de Cuba, and Mantanzas. Railway communication is established from one end of the island to the other, with more than 3,000 miles of track.

CUCK'OO. Many people know the cuckoo only as a clock from which a little bird appears through a door crying the hours, "Cuckoo, cuckoo, cuckoo." But this clock bird is only an imitation of the real cuckoo.

Since the cuckoo's call is readily imitated by musical instruments, the cuckoo has found a place in music, notably Beethoven's 'Pastoral Symphony'. The bird is also of very ancient literary reputation.

Cuckoos number about 200 species, found mainly in the Eastern Hemisphere. In general they are birds of dull grayish-brown plumage, though some of the Old World species are remarkable for showy coloration (for illustration in colors *see* Birds). The female of the European species, like the American cowbird, builds no nest, but places her eggs, one at a time, in the nests of other birds, even removing the eggs of the nest's owner in order to leave plenty of room for her own. Once her egg is placed, she gives it no further attention, and it is incubated and the young one reared by the foster parents.

CUCKOO'S FEEDING TIME

The mother bird has her favorite food—a tent caterpillar.

This practice however is not common among the cuckoos of America. The yellow-billed cuckoo and the black-billed cuckoo, the two best known American species, occasionally exchange nesting courtesies and hatch and rear each other's young, but each builds her own nest and cares for her family. These American cuckoos are often called rain-crows.

The hollow "cow-cow" note of the American cuckoos is weird and mournful, and only slightly resembles the cuckoo call of the European species. It is a shock to find that these most respectable-looking birds are bold and heartless robbers, who steal and eat the eggs of their smaller neighbors. However, it should be said that they also feed on destructive caterpillars. The stomach of one yellow-billed cuckoo was found to contain 250 tent caterpillars, and it frequently happens that a cuckoo's stomach is found to be completely furred on the inside with caterpillar hairs. Few birds feed on these insects, so the cuckoo can be forgiven its other shortcomings.

The cuckoos constitute a separate order of birds, in which are placed also the road-runners and kingfishers. Scientific name of European cuckoo, *Cuculus canorus;* yellow-billed cuckoo, *Coccyzus americanus;* black-billed, *Coccyzus erythrophthalmus.*

CUCUMBER. Used unripe for pickling and as a salad, the cucumber is one of our favorite vegetables, and boiled it forms one of the staple articles of diet in the Far East and in Jamaica. For at least 3,000 years it has been cultivated in northern India, where it probably originated. It is now extensively grown in all civilized countries as a field and garden crop, and of late years the forcing of cucumbers in hothouses all the year round has come to be an important industry.

The fruit is borne on a trailing prickly vine which shows clearly its relationship to the melons, pumpkins, squashes, and gourds. When the fruits are small the skin is spiny, but as they mature it becomes smooth. The skin is still green when they are gathered for use as salads or pickles, and the flesh, which is white and somewhat watery, contains many soft flattened seeds. As they ripen, the skin becomes yellow, the flesh tough, and the seeds large and hard. Some varieties are very small, only two to four inches long when they mature; while a "serpent" cucumber, grown usually as a curiosity, twists its slender body in and out among the foliage for nearly a yard. The white spine is probably the most popular group of varieties for garden and hothouse cultivation in the United States.

A variety growing steadily in favor is the lemon cucumber, so named because it is about the size and color of a lemon. It will grow in almost every part of the United States. The gherkin cucumber is a native of Jamaica, and is largely grown in the West Indies for pickling. The gherkins of mixed pickles, however, are young cucumbers.

Cucumber vines grow quite long, so it is necessary to plant the hills several feet apart. Sunshine and fresh air and moist rich earth, neither extremely heavy nor sandy, are needed for their successful cultivation. Scientific name of common cucumber, *Cucumis sativus.*

CUNE'IFORM. Probably the oldest system of writing in the world—aside from primitive "picture-writing"—is the "cuneiform" writing, invented by the ancient Sumerians and adopted and used by the Babylonians, Assyrians, and Persians for 3,000 years. It gets its name from the wedge-shaped marks—usually impressed on soft clay tablets which are then baked—which make up its syllabic signs and alphabet. Thousands of such tablets and longer inscriptions have come down to us; and since the discovery of the key to this writing, about 1850, our knowledge of the history of the ancient East has been almost completely reconstructed. (*See* Babylonia and Assyria; Writing.)

CUPID AND PSYCHE (*sī'kē*). According to one of the most charming myths of the Greeks and Romans, Psyche was the youngest daughter of a king and so lovely that she aroused the jealousy of Venus, the goddess of love and beauty, who sent her son Cupid (Eros) to the maiden to inspire her with love for some base man. But Cupid himself was so impressed with her charms that he wafted her away to his palace. There he visited her every night, earnestly requesting her not to seek to know who he was. But her jealous sisters, working upon her fears and her curiosity, induced her to light a lamp while Cupid was asleep and gaze upon him. When she saw that her lover was the handsomest of the gods, in her excitement, she let a drop of hot oil fall on his shoulder. This awoke him, and upbraiding her for her doubts, he forsook her. Wandering about in search of Cupid, Psyche came at length to the palace of Venus, where she was seized by the goddess and forced to perform the most difficult tasks. But Cupid rescued her, and at his entreaty she was received among the gods and united to him in wedlock.

THE MISCHIEVOUS GOD OF LOVE

"Cupid's darts" are famous in legend and story as the cause of love and hate. This beautiful statue of the frolicsome god was made by the French sculptor, Marqueste.

The name Psyche means "soul," and this story, which is one of the later classic myths, is usually considered an allegory representing the progress of the soul through earthly passion and misfortune to eternal peace and joy. The Romans pictured Cupid as a blindfolded mischievous boy, carrying a bow and shooting thoughtlessly, and often at random, his arrows which caused love or hate. They said that no living creature was safe from his arrows; fish, birds, beasts, gods, and mortals were all his victims. The Greeks, who called him Eros, worshiped him as not only the god of love but also of friendship.

CURLING. The national winter sport of Scotland is curling, a game of ancient origin. From Scotland the game has spread to many countries and is now played by numerous clubs in the northern part of the United States, in Canada, and in Switzerland.

The space marked out for playing is a "rink," and the ice should be hard and smooth, "keen and clear," as curlers call it. The rink is usually 42 yards long and 8 or 9 yards wide. At each end of the rink there is a "tee" surrounded by two circles, one with a diameter of 4 feet, the other with a diameter of 7 feet. Several yards in front of each tee there is a line that is called the "hog score." The object of the game is to send the curling stone, which is made of granite, as near as possible to the tee and to block off your opponent's stones from entering the seven-foot circle.

There are usually four players on a side and each player has two stones which he sends from an iron footboard called a "crampit," placed just behind the tee. The weight of the stone is usually between 30 and 44 pounds, and it is equipped with a handle which the curler grips as he swings it forward to send it along the ice. Each player is also equipped with a broom which he uses to clean or "soop" the ice of any snow or impeding obstacles that may prevent the stone of a player on his side from reaching the tee or from striking an adversary's stone. All stones that fail to reach the hog score are removed from the rink, and in counting points only those stones that remain within the circle after all the contestants have taken their turns win a point. Two leaders called "skips" command the opposing teams, giving directions to the "soopers."

CURRANTS. The little dried currants which add their delicious flavor to fruit cakes and puddings are the dried fruit of a seedless variety of grape. The name is a corruption of "Corinth" (Greece), whence they were first brought to the markets of western Europe. Greece and Asia Minor still grow large vineyards of this grape. When the fruit is ripe, they are gathered and dried in the sun. The fresh fruit is very sweet and highly flavored. Scientific name of the currant grape, *Vitis vinifera.*

The shrubby "currant" bushes of our gardens are not currants at all, but were so named from the resemblance of their fruit to the dried currants of commerce. They belong to the same genus of plants as the gooseberry. There are two common species, red and black (*Ribes nigrum* and *Ribes rubrum*). White currants are a cultivated variety of the red currant. Both varieties are highly prized for making pies, jellies, and jams.

CURRIE, GEN. SIR ARTHUR (1875–   ). "The Canadian Foch" is the name sometimes given to Gen. Sir Arthur William Currie, C.B., G.C.M.G., who was commander of the Canadian Corps on the Western front during the latter half of the World War. He was born on Dec. 5, 1875, in an obscure village in western Ontario, and after an education obtained in the public schools of his native province he went, at the early age of 18, to British Columbia. There he engaged first in school teaching, and then in business.

Ultimately he rose to be head of one of the leading insurance and real estate firms of Vancouver Island.

Business, however, did not wholly engross his attention. From an early date he took an active interest in the Canadian militia. Enlisting in the Garrison Artillery, he became after 14 years of service the lieutenant-colonel of his unit; and he acquired the reputation of being one of the most efficient militia officers in the Dominion. The result was that when the war broke out, and he offered his services to the Militia Department, he was appointed to the command of the Second Canadian Infantry Brigade of the First Canadian Contingent. In the war his rise was rapid. At the Second Battle of Ypres—that glorious fight where the Canadians were reputed to have "saved the situation"—he and his brigade so distinguished themselves that shortly afterwards, on the organization of the Canadian Corps, he was given command of the first Canadian Division, with the rank of major-general. This veteran division he commanded throughout the bitter fighting of the autumn of 1915, the whole of 1916, and the spring of 1917—through the engagements of Sanctuary Wood, the Somme, and Vimy Ridge. In the summer of 1917, Sir Julian Byng, the Canadian Corps Commander, was promoted to the command of the Third British Army; and the honor of commanding the Canadian Corps in his place fell to General Currie.

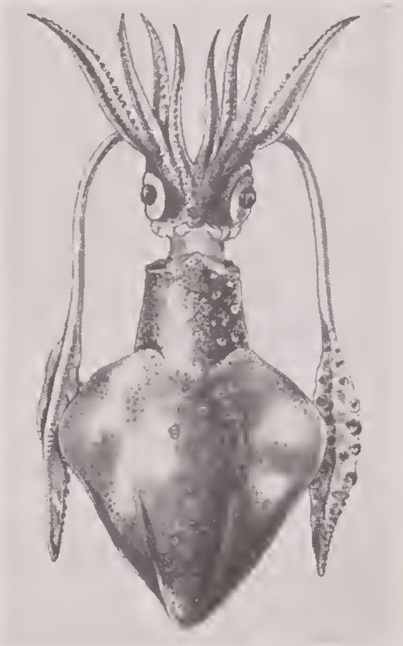
That a civilian soldier should have been chosen for so important and difficult a post was a signal tribute to General Currie's ability. The confidence shown in him, however, was amply justified by the results. He led the Canadian Army through the battles of Lens and Passchendaele Ridge and through the titanic struggles of "the Hundred Days" in 1918 with such success that the name of Canada resounded through the world. It is a sober fact that, under him, the Canadian Corps never failed to take any objective assigned to them. They came to be reckoned among the best "shock-troops" on the British front.

On demobilization, General Currie—who had been knighted for his services in 1915, and also given the grand cross of the Order of St. Michael and St. George—was appointed Inspector-General of the Canadian militia. This position he occupied for only a short time, for in the summer of 1920 McGill University at Montreal invited him to become its principal and he accepted.

WRITHING *Many-Armed* CREATURES *of the* SEA

The Squid's ten writhing arms viewed from below.

WHO would guess that such dissimilar articles as toothpowder, cuttlebone for canaries, and the rich brown pigment called "sepia" used by painters, are obtained from a flattened spotted creature of the sea? Yet all these come from the Cuttlefish. The name however is misleading, for the Cuttlefish is not a real "fish" at all, but a near relative of the Octopus, Squid, and Nautilus—all members of that division of mollusks called cephalopods. Many of these "head-footed" creatures, with the writhing muscular arms set with rows of suckers, are quite small; but others, like the Giant Squid, are monsters of such gigantic size that they do battle with the lordly Sperm Whale of the South Pacific.

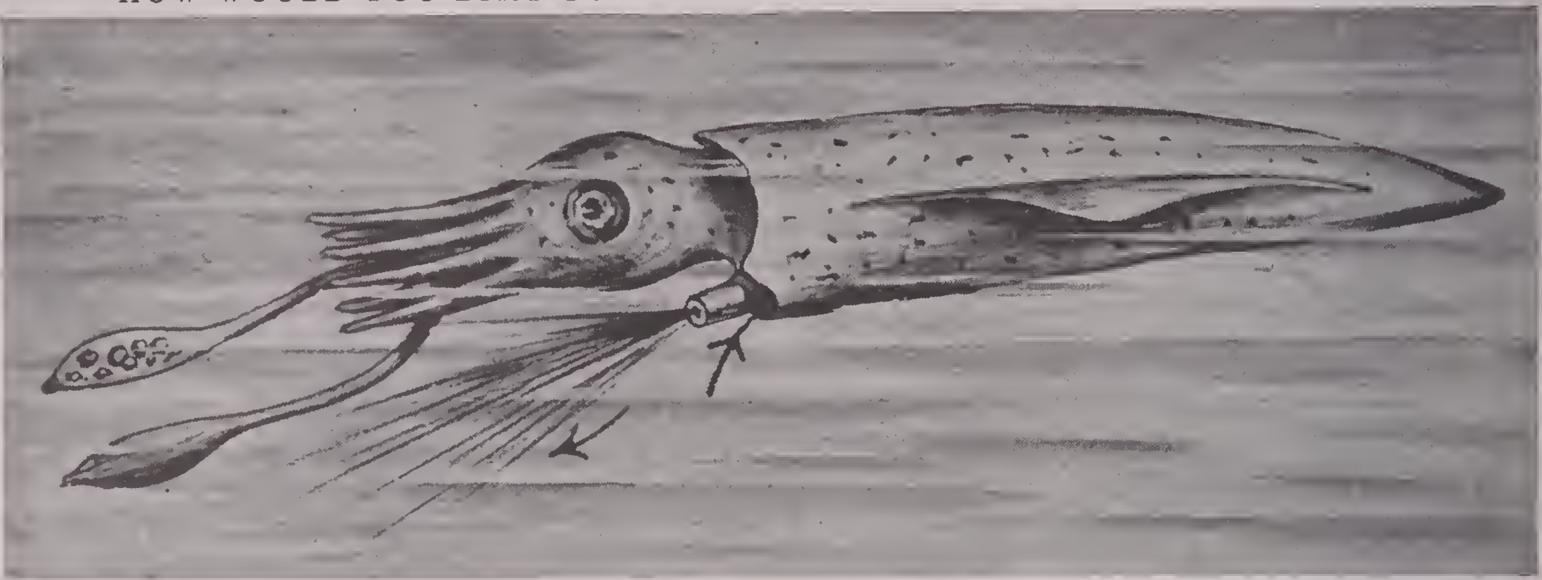


Top-side of a Squid, showing its goggle eyes.

CUTTLEFISH, SQUID, AND OCTOPUS. The cuttlefish gets its name from a peculiar modified shell called the "pen" or cuttlebone, which lies along the back of the creature, beneath the skin, and serves as a brace. Another curious organ, the sepia-sac or ink-bag, is a pear-shaped body placed below the covering of the mantle cavity; it contains the "sepia," a dark fluid which is discharged to the exterior through a tube, producing a black cloud in the water under cover of which the cuttlefish may escape from an enemy.

Like the squid, the cuttlefish has ten arms, arranged in pairs on the right and left sides of the head. Four pairs of arms are stout at the base and taper toward the ends, and each bears four rows of cup-shaped suckers. A fifth pair of arms, usually called tentacles, are much longer and bear suckers only on their free ends, which are somewhat thickened and clublike. There is a distinct head bearing two highly developed unwinking eyes, and sense organs corresponding to ears are also present. The body is shield-shaped, the base of the shield being near the head. Between the body and the neck a funnel, called the siphon, extends from the mantle cavity to the exterior. Through this funnel the fluid in the ink-sac is ejected and the wastes from the body are expelled. The siphon is also the organ of respiration and the chief organ of locomotion. By forcibly discharging the water which flows into it from the mantle cavity the cuttlefish can dart rapidly backward. Movement is also aided by the thin muscular folds on either side of the body, called the fins. The brain of the cuttlefish is highly organized.

HOW WOULD YOU LIKE TO MEET THIS CREATURE IN YOUR DREAMS?

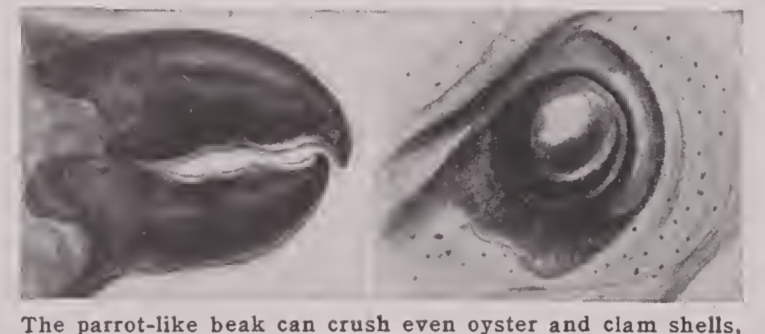


The common Squid shown above is only a foot or two in length, but some species are said to attain a length of fifty feet or more. These horrible creatures figure in many a weird story of the sea. The illustration shows the "pump" with which the squid propels himself backward, and also squirts out the "sepia ink" that hides him from his foes. One arrow shows how water is drawn into the mantle around the siphon, and the other shows the water being expelled.

Forms of cuttlefish are found near the shores of North America, Australia, and Europe, some live in the deep sea. Those of the Mediterranean Sea are usually nine or ten inches in length and live in waters from 60 to 240 feet deep. They come into shallower water in July and August to deposit their eggs, which are about the size and color of black currants. The eggs are attached to each other and to the ocean floor by means of gelatinous stalks.

The food of the cuttlefish consists of fish and various crustacea, such as prawns, shrimps, and crabs. Upon these it steals unseen, grasping them by shooting out from their sheaths its two long arms. Its prey is then torn to pieces with its strong beak.

BEAK AND EYE OF THE CUTTLEFISH



The parrot-like beak can crush even oyster and clam shells, to say nothing of crawfish and lobster bodies. The unwinking eye seems to have an evil stare.

In the stories told by sailors and fishermen the squid and the octopus are often referred to as "cuttlefish," and the cuttlefish is sometimes called a "squid." Victor Hugo, in his novel 'The Toilers of the Sea', begins his description of what is really the giant squid with the words, "To believe in the octopus, we must have seen it." While commending the vividness of his word-picture, naturalists object to his use of the term "octopus" for this creature.

Careful observers state that the giant squids of the northeastern coast of America often attain a total length of 55 feet. The tentacular arms of such a specimen are 35 feet, and the body 20 feet in length. The circumference of the body of such an animal is 12 feet, and the weight, including all the arms, is nearly 1,000 pounds. The width of a large "sucker" is 2¼ inches, and the breadth of an eye-opening, 9 inches. Some large specimens have been captured on the Grand Banks of Newfoundland and used for bait. The squids are active at night and appear on the surface of the water during the day only if injured or disabled. Aside from man the sperm whale is their greatest enemy and devours large numbers. The squid does not yield easily, however, even to the whale, but sometimes leaves deep wounds from its suckers around the jaws of its big antagonist. The giant squid is sometimes called the "devil-fish," but this name properly belongs to a skate-like tropical fish.

The common squid ranges in length from 6 to 18 inches, and is found in great numbers in nearly all seas. On the east coast of North America they are used as bait; on the Pacific coast, in the Philippines, in Japan, and in the countries bordering on the Mediterranean Sea, they are used for food.

In form the squid is like an elongated cuttlefish. The body is cylindrical with a triangular fin on either side of the posterior end, which is pointed. Like the cuttlefish it has four pairs of arms of equal length, and one pair of very long arms or tentacles, a siphon, an ink-sac, a highly developed brain and nervous system, and the power to change color so as to resemble its environment.

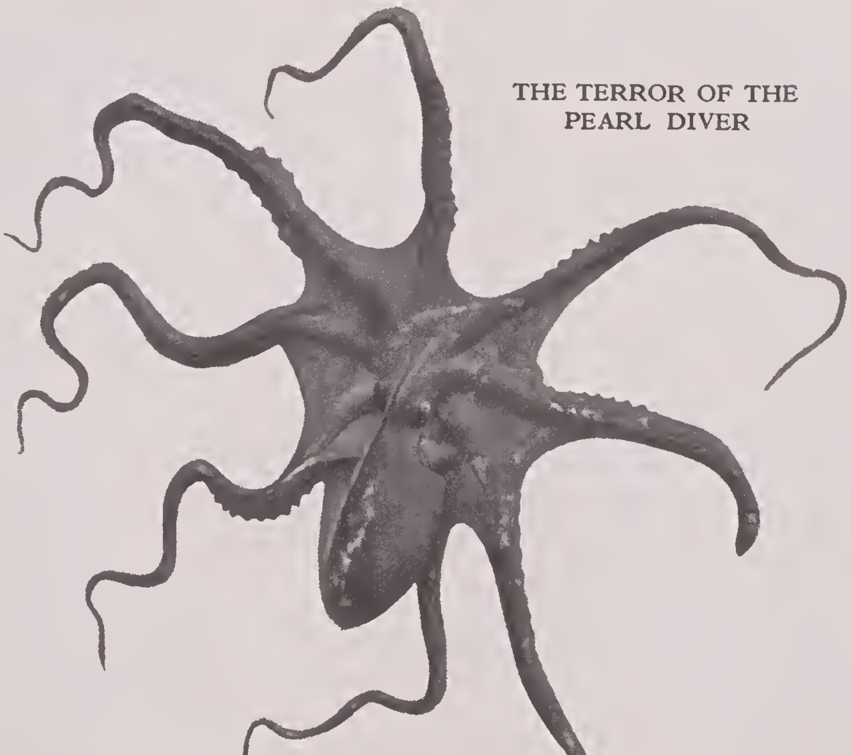
The name "octopus," which is correctly applied to another group of the cephalopods, much smaller than the giant squid, means "eight-footed," the "feet" being the tentacles or "arms." Curiously enough, both terms are correct, for the tentacles are outgrowths of that part of the body which, in its relatives the clam and the oyster, is called the "foot," yet they are of little use in locomotion except to assist in creeping. Like arms they are used for grasping. They are longer than the body, and are alike except in the breeding season, when one of them, in the male, becomes enlarged. Each arm carries two rows of cup-shaped suckers.

THE FIRST INVENTOR OF THE "SMOKE SCREEN"

Here is a Squid throwing out a cloud of ink to confuse its pursuer, while it retreats. The ink is "sepia," which is widely used as a coloring fluid. So durable is this substance that the dried sepia, discovered in fossil octopi, has been found perfectly serviceable as a dye.

The body of an octopus is shaped like an oval bag. It has a definite head bearing a pair of large, staring, highly developed eyes. Its mouth is in the middle of the disk formed by the tentacles, and it possesses large jaws shaped almost like the beak of a parrot. Behind the head is the neck and in this is an opening which communicates with the mantle cavity. Here also is the siphon, the chief organ of locomotion. Like the cuttlefish and the squid, the octopus possesses an ink-sac the contents of which it can discharge into the water when seeking to escape from an enemy.

THE TERROR OF THE PEARL DIVER



The Octopus is an eight-armed relative of the ten-armed squid. South Sea pearl divers, seized by this creature, have been known to escape by cracking with their teeth a pea-like nerve ganglion lying between the eyes. This paralyzes the creature.

There are about 50 known species of the octopus distributed throughout the ocean waters of the world. They are oftener found near the shore than in deep water. During the day it is usually inactive, hiding in tide pools or among rocks. When at rest the body is often held in a vertical position by the tentacles, the ends of which rest on the floor of its home. It hunts at night and subsists on crabs and other shellfish. At times it becomes so abundant on the coasts of England and France as to seriously interfere with the oyster and lobster fisheries.

While the members of the octopus family are usually timid, fleeing at the approach of man, they will grasp and cling to any living thing which touches them. Some of the larger specimens have been known to pull down swimmers and pearl divers, holding them in their grip until the hapless victims were drowned. The South Sea natives sometimes rid themselves of the clutch of the octopus by cracking with their teeth a small pea-like nerve center that lies beneath the flesh between the creature's eyes. This has the effect of paralyzing the octopus, which otherwise keeps on writhing even when nearly chopped to bits.

In one American species the tentacles or arms reach a length of 16 feet and a spread of 33 feet. But the body of such an animal is only six inches in diameter and a foot in length. The octopus of the West Indies and the Mediterranean attains a length of nine feet and a weight of 68 pounds. In Mediterranean ports the flesh of the octopus is considered a delicacy and is used in the preparation of salads. It is abundant, and an important article of food in Japan also. There the octopus is caught by the use of earthenware pots which are lowered to the bottom of the sea with cords. These are entered by the animals, which, when once settled, are reluctant to withdraw, so the pots may be pulled to the surface before the animals try to escape. Fishermen everywhere use the octopus as well as the squid for bait.

Owing probably to Victor Hugo's use of the term "octopus" for the giant squid, the term octopus has been used in American politics to apply to giant business and political organizations which were supposed to endanger the national life. (*See* Mollusks; Sea-Serpent.)

CUTWORM. In a single night an army of these caterpillar pests has been known to ruin a fine garden of young vegetables or a field of wheat or corn. In their adult stage they are "owlet moths," so named because their eyes glow in the dark.

The female moth lays her eggs in the late summer on plants near the ground. When the *larvae* or cutworms hatch out, they burrow into the ground and feed upon the tender roots of grasses and other plants. When spring comes they attack the growing vegetation, and it is at this time that they do the greatest damage. During the day they hide in the soil, but at night they come out and eat through the plants close to or just beneath the surface. Sometimes they climb into the trees and vines and eat young leaves or fruit.

Cutworms can be killed with sprays or by sprinkling the ground with a mixture of paris green, bran, and sweetened water. One way to protect a growing plant is to fold a piece of stiff paper around the plant stem, reaching an inch or so into the ground. Toads and robins help to keep down their numbers. (*See* Butterflies and Moths.)

The species are numerous. Some of the common varieties are bean-cutworm, *Ogdoconta cinereola;* black cutworm, *Agrotis ypsilon;* climbing cutworm, *Agrotis scandens;* clover-cutworm, *Mamestra trifolii.*

CYANIDES. These very poisonous but useful compounds are salts of hydrocyanic or prussic acid (HNC). Hydrocyanic acid, which is one of the most poisonous substances known, is found in the kernels of cherries, peaches, and plums, in combination with glucose and other substances. That is why you ought not to eat the kernels of fruit pits. The vapor of hydrocyanic acid, which has an odor like bitter almonds, is excellent for fumigating. But the greatest caution must be used to avoid poisoning anyone.

Sodium cyanide (NaNC) and potassium cyanide (KNC) in solution readily dissolve gold and are used in extracting gold from its ores (*see* Gold). Cyanide solutions of gold and silver are useful in electroplating. Complex double cyanides of iron and potassium, called potassium ferrocyanide and potassium ferricyanide, are useful in dye industries. The latter forms part of the sensitive coating of "blue print" papers.

CYCLONE. Properly a cyclone is a windstorm—often covering a wide area and lasting several days—in which the winds blow spirally about a central area of relatively low barometric pressure. In the Southern Hemisphere the winds revolve in the direction of the hands of a clock, and in the Northern Hemisphere they blow counter-clockwise. In popular usage, the term cyclone is used to designate a tornado or any violent and destructive windstorm. (*See* Storms.)

CYCLOPS. In Greek mythology the Cyclops were giants with a single round eye in the middle of their foreheads. They were akin to the Titans. While some legends said they were great builders and assistants to Hephaestus, the god of fire and metal-making, older traditions made them out to be lawless shepherds, who devoured human beings and cared nothing for Zeus. The most noted of the Cyclops was Polyphemus, the son of Poseidon (Neptune) and a sea nymph.

How Odysseus and His Men Outwitted the Cyclops

WHEN the Greeks had captured and burned the city of Troy, no hero made greater haste to set sail for home than Odysseus (Ulysses), King of Ithaca. After ten years of war before Troy, he desired nothing but to grow old in peace beside his faithful wife Penelope; and to teach his young son Telemachus courage and wisdom.

But the adventures of Odysseus had just begun. Ill winds blew him far out of his course. In shipwreck and in battle on a foreign coast, he lost both men and galleys. In Lotus Land he saved his men from the enchantment of forgetfulness by binding them and casting them under the benches of the ship. Then by ill luck he offended Poseidon (Neptune), god of the sea, whose wrath set him wandering for ten weary years.

This is how that terrible mishap befell him, and what came of it: Lost in strange waters far to the west of Greece, Odysseus came to a country that is now known as Sicily. It was a beautiful and fertile land, but he would never have gone ashore had he known it for the country of the Cyclops, a race of one-eyed cannibal giants. The Cyclops were few, and they lived in caves high in the mountains like wild animals in dens. Odysseus landed with 12 men and climbed to an enormous cave that was stored with good food. Nobody was at home, but the adventurers were so hungry that they made a feast.

Suddenly a shadow like that of a big tree darkened the opening, and they heard a voice that rumbled like a volcano. The owner of the cave had come home! His name was Polyphemus. A surly monster, the largest and fiercest of the savage race of Cyclops, he lived alone in this huge cavern. Driving his sheep and goats in before him, he closed the opening with a stone block that 20 great wagons could not have moved. His one eye glared like a ball of fire. Swinging a club as big as a ship's mast, he killed two of his uninvited guests at one blow. The cannibal ate them for his supper, crunching their bones like a lion. Then he went to sleep.

Odysseus could have killed the sleeping monster with his sword, but he stayed his hand because no one but the giant could move the stone. Polyphemus ate two more men for breakfast, and then going out with

When the one-eyed Polyphemus imprisoned them in his cave and began eating two of them for every meal, Odysseus and the surviving members of his crew were in despair. Finally they put out the Cyclops' one eye, and escaped by clinging beneath his sheep when he let them out to pasture.

his flocks, he closed the entrance again with the stone, leaving Odysseus and his men prisoners.

Odysseus' wit had got him out of trouble more than once. So now the inventor of the Wooden Horse of Troy thought of a clever plan of escape. After two more of his men had been eaten for supper, he pretended friendliness and gave the cannibal a goat-skin filled with strong wine. Polyphemus, delighted with the wine, called for more, and inquired the name of the kind stranger. Odysseus supplied him again and again, and in reply to his question, said, "Noman is my name." Soon the giant fell into a drunken sleep. The crafty Odysseus, taking a piece of the monster's huge staff, sharpened it to a point, heated it in the fire, and put out the giant's one eye.

Mad with pain and blindness, and bellowing like a hundred bulls, Polyphemus charged around the cavern. His brother Cyclops, hearing him, rushed to the door of the cave. But when he cried out, "Noman is slaying me!" they replied, "If no man hurts thee, the blow must be sent by the gods, and we can do naught," and they left him to his fate. At last Polyphemus rolled away the stone and stretched himself across the opening, hoping to catch the intruders as they tried to escape. But Odysseus tied the sheep in threes, and beneath each three he tied one of his men. He himself hung under the body of a great ram, clinging with his hands and feet.

THE CHASE THROUGH THE NIGHT

Bellowing with pain and rage, the blinded Cyclops groped for his victims. But the nimble Greeks eluded him.

When morning came, the flocks hastened forth to pasture. Polyphemus passed his hands only over the backs of the animals as they ran out, so Odysseus and his six men escaped down the mountain to the ship.

With powerful strokes of the oars they pushed out to sea. Before they had got out of hearing Odysseus hurled back a taunt: "Cyclops, thy evil deeds were sure to find thee out, thou cruel man, who hast no shame to eat thy guests."

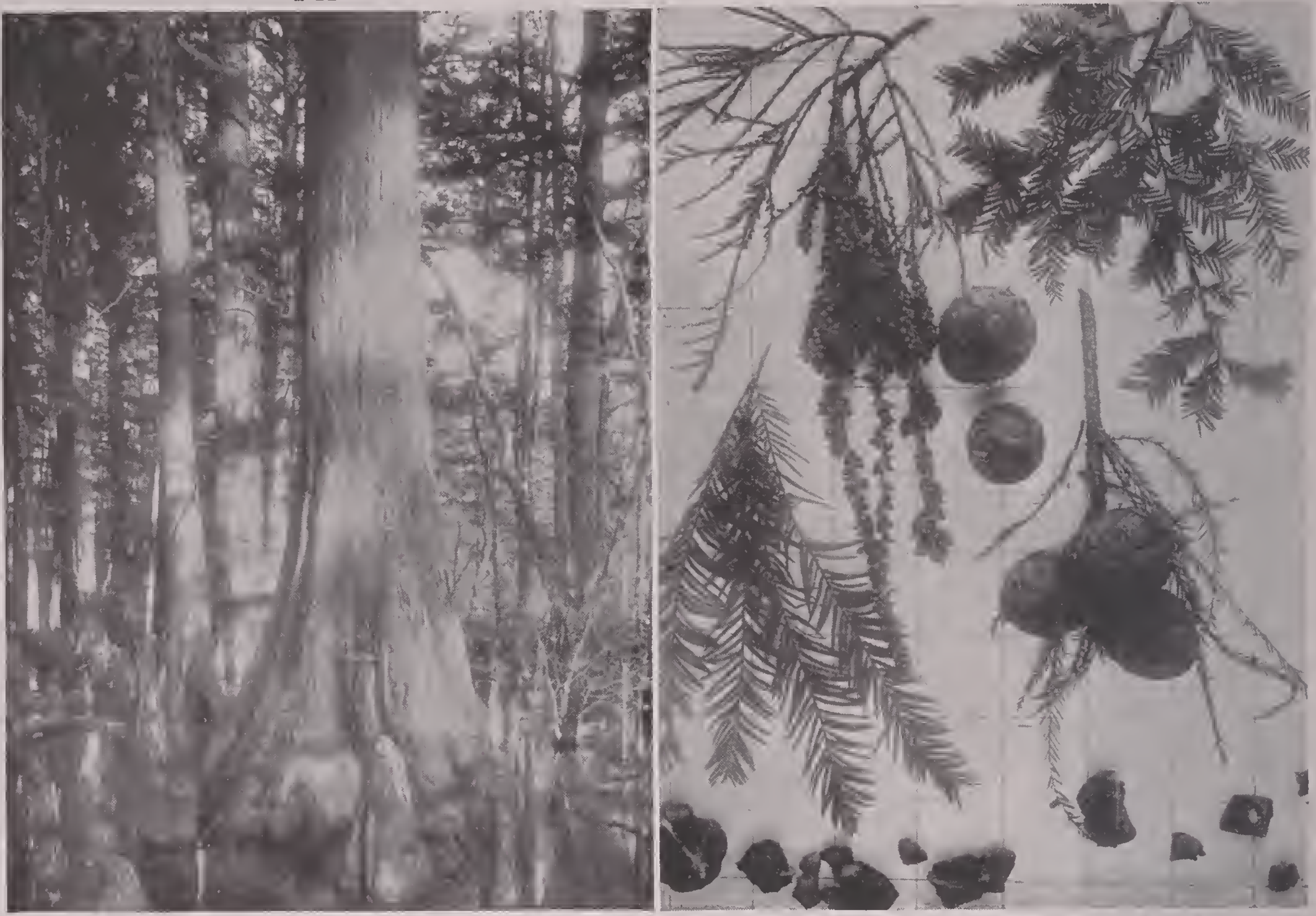
The angry Polyphemus broke off the peak of a great hill and threw it at the ship, which was washed back by the mountainous wave almost to the shore. When the crew had again got the vessel well out to sea, the undaunted Odysseus flung back another taunt that cost him dear:

"Ha, Cyclops! If anyone ask thee who put out thine eye, tell him it was Odysseus, the waster of cities."

That was a foolish boast, for Polyphemus was a son of Poseidon, who ruled the sea. He called upon his father to stir up the waters and pursue Odysseus with his wrath so that he could never win his way home.

The angy sea-god heard his son's plea and avenged the injury. For ten long years he made Odysseus a wanderer, driving him over the stormy waters of the world.—*Retold from Homer's 'Odyssey', Book* ix.

THE CYPRESS GIANT OF THE SWAMPS



Famous throughout the ages for its beautiful and durable wood, the Cypress has a right to hold itself proudly aloft as the most lordly tree in its surroundings. Throughout the South of the United States the so-called "bald cypress" towers calm and serene above the swamps in which it grows. From time to time its roots, suffering in their watery home for lack of air, throw up curious "knees" above the surface. You can see one of these directly in front of the largest tree. The spherical cones and needle-like foliage, shown in the right-hand picture, are also distinctive features of the Cypress. As may be imagined from its ability to live in swamps, the Cypress furnishes wood which stands exposure to moisture, and Cypress poles are in great demand for fence posts and telegraph poles.

CYPRESS. Of all the woods that are used for manufacturing and building, the cypress is one of the most durable. For 1,100 years the great cypress doors of St. Peter's Church in Rome lasted without a sign of decay, until Pope Eugenius the Fourth replaced them with bronze. Egyptian mummy cases of cypress have resisted the attacks of time for thousands of years.

Aside from the Old World varieties there are several genera and species of this tree in North America. The so-called yellow cedar and Lawson spruce are native to the Pacific coast. These trees are conifers and are evergreen, as are the Old World varieties. The bald cypress of the Gulf States, on the other hand, is deciduous, shedding its foliage with the approach of winter. It is one of the most important commercially of our timber trees. The trees of this species usually prefer the lowlands, though beautifully matured specimens are found in the hill-lands bordering the Mississippi River.

In the cypress swamps, as the tracts covered with this timber are called, the trees grow majestically tall and strong, with slender limbs and dense delicate foliage. Towering above the rustling palmettos and gnarled live-oaks, their rounded tops shut out the sun. Graceful rambling vines climb up their trunks, mingling dainty blossoms and waxlike leaves with the pale needle-like foliage. Odd-looking "cypress knees," or bulging roots, are exposed above the ground, and in the half-light they look like brown baldheaded gnomes, standing silent among the trailing mosses and fallen logs.

The wood of the bald cypress is light, soft, straight-grained, and easily worked. Since it is durable in contact with the soil, it is especially adapted for use as railway ties and fence posts as well as for general building purposes. The lumber from other species is in demand for cabinet work and the making of musical instruments, for it is fine grained and works up beautifully. Louisiana furnishes about two-thirds of the cypress lumber of the United States, Florida ranking second. Georgia, Arkansas, and North and South Carolina are also sources of supply.

Scientific name of bald cypress, *Taxodium distichum*. Bark reddish brown, slightly furrowed. Leaves light green, simple, awl-shaped, and overlapping, very pointed. Flowers inconspicuous, appearing before the leaves. Cones light brown, small, globular. The yellow cedar and Lawson spruce belong to the genus *Cupressus*.

CY'PRUS. "Copper" does not sound exactly like "Cyprus," unless you pronounce the latter with a hard "C," but nevertheless the name of this metal comes from the Greek name (*kupros*) for the island which was famed in ancient times for its copper mines. Cyprus lies in the easternmost part of the Mediterranean Sea, south of Asia Minor and west of Syria. It is the third largest of the Mediterranean islands, covering an area of 3,584 square miles, nearly three times that of the state of Rhode Island.

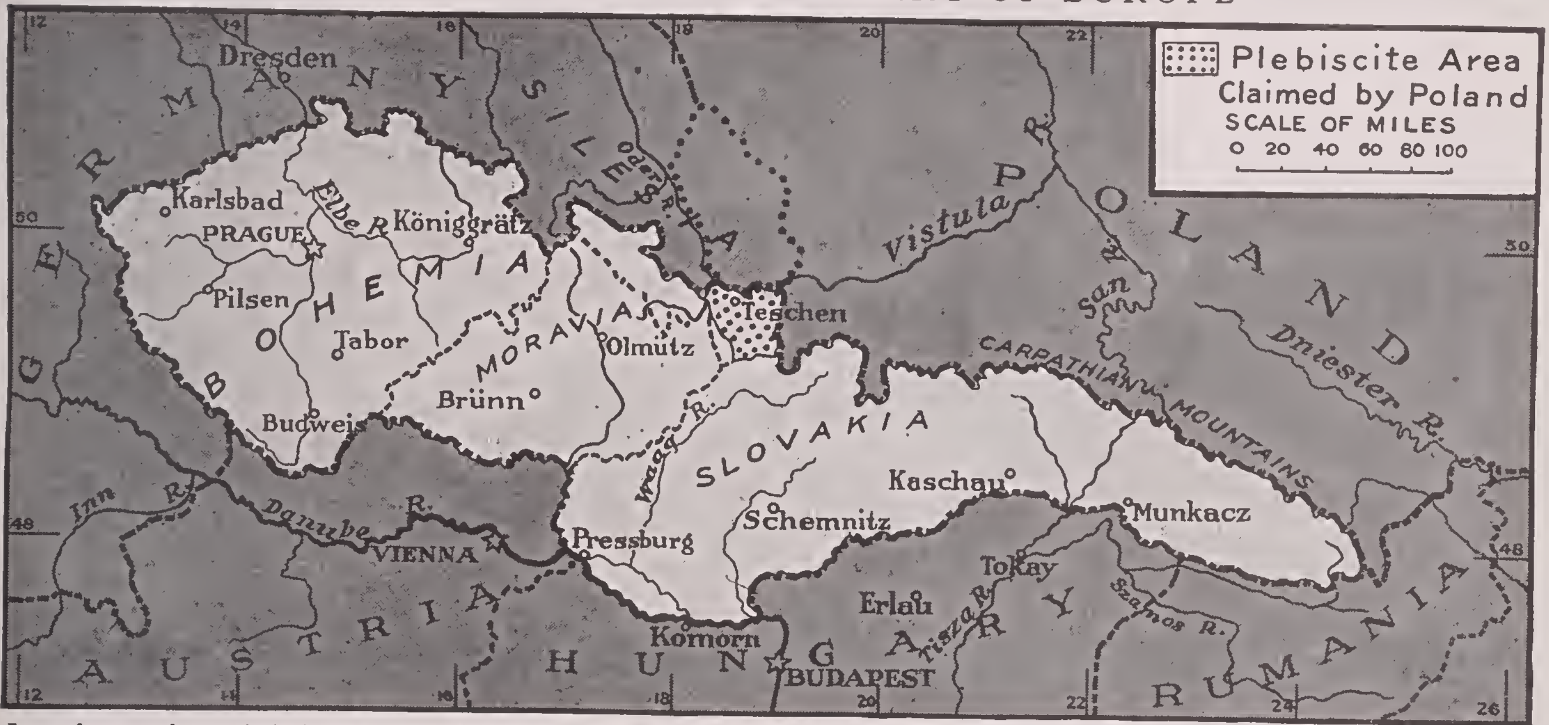
Frequent mention is made of Cyprus in both the legends and the history of ancient times. According to one Greek story it was the home of the goddess Aphrodite, who sprang from the sea foam near its shores. The island first appears in history about 1500 B.C., when it was conquered by the Egyptians. The Egyptians were followed by the Phoenicians, and these by the Greeks, who established colonies there. In the 6th century B.C. it became a part of the Persian Empire, and two centuries later it came under the rule of Alexander the Great. It was taken by the Romans in 58 B.C. The Cypriotes were early converted to Christianity by St. Barnabas, who visited the island with St. Paul. In the Middle Ages the island formed part of the Byzantine Empire. Then it was conquered by Richard I of England ("the Lion-Hearted") during the Third Crusade. In 1489 it was taken from the last descendant of the crusading rulers by Venice, and a century later it became part of the Turkish Empire. In 1878 the Turks gave over the administration of it to England in return for a yearly tribute; and in 1914, after Turkey's entrance into the World War on the side of the Central Powers, Great Britain formally annexed the island. Its importance to Great Britain is as an outpost for the defense of the Suez Canal.

Mountain ranges border the northern coast and occupy much of the southern part of Cyprus. Between them lies a plain once covered with forests which supplied timber for the ships of the Phoenicians and other ancient peoples, but which now in many places is barren and uncultivated. Such forests as remain are chiefly on the mountains. Cyprus is poorly watered, the streams being mainly mountain torrents that dry up in summer, and agriculture is backward except where irrigation is practiced. Wheat, barley, oats, cotton, silk cocoons, olives, and various fruits are produced. There are extensive vineyards, and both raisins and wine are exported in considerable quantities. Cattle and sheep are raised successfully and the mules are noted. Copper, though not so plentiful as in antiquity, is again being produced, and there are also quarries of sandstone, limestone, marble, and granite. Salt, which was also an important product in ancient times, is still obtained.

The people are mainly Greeks and Turks. About one-fourth of them are Mohammedans, the remainder belonging to the Orthodox Greek Catholic church. Population, about 310,000.

CZECHO-SLOVAK (*chĕk'ō-slō-văk'*) **REPUBLIC.** The most promising and firmly established of the states created by the defeat of Germany and Austria-Hungary in the World War is the Czecho-Slovak Republic, or Czecho-Slovakia, as it is sometimes called.

A NEW STATE IN THE HEART OF EUROPE



Long famous for their industry and manufacturing skill, the Bohemians or Czechs, with their blood-relatives the Slovaks, bid fair to build a prosperous nation now they are freed from Hapsburg rule. Bohemia is rich in minerals and fertile lands.

Above the red tile roofs and the strange church towers of Prague, the capital, and its other industrial cities, smoke streams from many factory chimneys, for Czecho-Slovakia is rich in manufactures. There are extensive deposits of iron, coal, and lignite, copper, silver, gold, and clay. Everywhere outside the towns are broad rich fields of grain, potatoes, sugar beets, and mustard. Goats and cattle browse on the hillsides, ducks and geese waddle in the mudholes, and peasant women with bare feet, short skirts, and bright-colored handkerchiefs knotted over their heads bend their sturdy backs to the work of the fields. The Czechs (*chĕks*), who are an energetic western Slavic people, are very fond of athletics, and their "sokols" or gymnastic societies are world famous.

A well-organized Czecho-Slovak army, estimated at 100,000 men, fought valiantly in Russia on the side of the Allies in the course of the war. Even before the end of the struggle the Allies recognized the independence of Czecho-Slovakia from Austrian rule (Great Britain, Aug. 3, 1918; United States, Sept. 3, 1918). Under Prof. Thomas G. Masaryk, the first president of the new republic, a democratic constitution was adopted, with equal suffrage for men and women. It is said that enthusiasm for learning the English language is now second only to enthusiasm for the American sport of baseball.

The western half of the new state is made up of the former Austrian provinces of Bohemia and Moravia, where the bulk of the population is Czechs. The eastern half includes Slovakia and Ruthenia, which formerly were parts of Hungary. The Slovaks are closely related to the Czechs in language and race, but are separated from them by the Little Carpathian Mountains. The Ruthenians (also called Rusins, or Little Russians) are Slavs who are more closely related to the Russians of the Ukraine; they are guaranteed "autonomy" (self-government) by the peace treaties. The non-Slavic peoples—chiefly Germans and Hungarians (Magyars)—are mostly on the borders, so that unity of race in the new state is little broken. There are many Czechs in the United States, and Chicago is sometimes called "the third Czech city in the world." The area of the new republic is about 54,700 square miles, only a little larger than Illinois, but its population of about 13,600,000 is over twice that of this state.

One difficulty the republic has to contend with is the fact that the rivers of the eastern half flow southward and that the upland inhabitants there formerly migrated to the Hungarian plain as farm laborers for summer work—a practice now practically cut off by the erection of a new political frontier. Another difficulty was a bitter dispute with Poland over the rich coal-mining region of Teschen, on the northern boundary. (*See* Austria-Hungary; Bohemia.)

D

DAEDALUS (*dĕ'dȧ-lŭs*). This fabled Athenian, according to Greek myth, was the first man to fly. He had been forced to leave Athens and took refuge in Crete, which was ruled by King Minos. There he built the famous Labyrinth for the man-bull, the Minotaur (*see* Crete). Soon after its completion Daedalus incurred the anger of King Minos, and he and his son Icarus were imprisoned in its mazes. In the Labyrinth Daedalus made wings of feathers and wax for himself and Icarus, in order that they might escape by flight. Daedalus flew safely out of the Labyrinth and over the Aegean to the island of Sicily. Icarus flew too near the sun, the wax of his wings melted, and he fell into the ocean.

DAHLIA (*däl'yȧ*). When the Spanish conquerors first invaded Mexico they probably found there the original dahlia, which, except for a few South American species, is a native of that country. Later it was taken to Spain and from there transferred to the rest of Europe, although it was not cultivated extensively until the last century. It has now attained high rank as a garden plant and is numbered among a dozen flowers which have special societies and exhibits in Europe and America. The flowers, which at first were single and flat with yellow disks and dull scarlet rays, have been changed from single to double and even to a globular shape, the colors varying from white to yellow and deep red but lacking in the blue shades. The different varieties bloom from the middle of June to November, and are most imposing when arranged in clustered masses according to height.

When the frost in the autumn has killed the tops of the dahlias, the plants should be dug and the tubers placed in a dry cool cellar until spring, when they may again be placed in the garden as soon as the danger from frost is past. Dahlias grow best in rich deep loam. They need some shade, plenty of water, and should be protected from cold winds. The plant may be propagated by seeds, by division of the tubers, or commercially by cuttings.

Dahlia is a genus of the family *Compositae*. The majority of the flowers now common have originated from a single species, *Dahlia variabilis*. The dahlia was named after the Swedish botanist Dahl.

That little calf shares its mother's milk with the little girl, and there seems to be enough for both, for these two small partners certainly look happy and healthy.

DAIRYING. Every day in the year, long before we are astir, the carts of the milkmen begin to rattle through the city streets and alleys, bringing us in sanitary bottles the milk for our morning oatmeal and cream for coffee. Did you ever think of the many persons who contribute to bring this about? If you follow the back-trail of the milkman you come first to the local bottling and distributing station, then perhaps to the wholesale milk dealer, and then to the train or interurban which gathers the boxes of bottles or the great locked milkcans and brings them long distances to the city. From the country station, auto or wagon tracks will lead you "over hill and down dale" until sooner or later you arrive at a big red barn, with some such name as "Hillcrest Dairy Farm" printed in large white letters on it. And there the farmer will show you the source of your milk and the pride of his farm — a fine herd of fat and healthy dairy cows!

Thousands of such dairy herds, grazing in quiet contentment on hillside and valley throughout nearly all the civilized world furnish the enormous quantity of fresh milk and cream which we consume, and also mountains of butter, cheese, condensed milk, and other dairy products. Of all farm animals, the dairy cow is the greatest producer of human food, and intelligently managed it brings in large profits to the farmer the year around. The milk produced annually by one dairy cow has a food value equal to about four barrels of wheat flour, and the total it yields in its lifetime equals the meat of a dozen or more beef animals.

Dairying has become one of the important industries of the world, and improvement has been very rapid, especially during the past 50 years. Betterment of the dairy herd is of first importance. Formerly cows were milked only during the spring and summer, when pastures were available, and were poorly fed and allowed to go dry during the winter months. The modern plan of feeding silage (green feeds stored in silos) has made possible year-around production and greatly increased the annual yield per cow. Making the cows comfortable in good barns and supplying good feed and plenty of clean fresh water is also rewarded by increased milk production.

There is no branch of animal industry where breeding and proper care have made such great and profitable changes as in the dairy herd. One pure-bred cow may bring in as large a profit as 40 "scrub cows," and it will produce in a month as much milk as the wild cow would in a year. A good Jersey will produce its own weight of butter in a year. The Guernsey is also noted for the richness of its milk. Other favorite dairy breeds, such as the Ayrshire and Holstein, are valued for the large quantities of milk produced, although it is not as rich in butter-fat as the milk of the Jersey. (*See* Agriculture).

Keeping Books on the Cow

Milk contains from 2 to 8 per cent of butter-fat. The dairyman must know how rich the milk is in butter-fat, as well as the quantity given by each cow, in order to grade the milk and to tell which cows are profitable milkers. The invention of the Babcock test by Dr. S. M. Babcock, of the Wisconsin Agricultural Experiment Station, gave a convenient and practical means of testing for butter-fat. A little sulphuric acid is added to measured samples of the milk to be tested; this frees the butter-fat and dissolves all the other milk solids. Then the samples in individual bottles are put into the tester and whirled around very rapidly. This causes the butter-fat to separate from the heavier portion of the milk, rising to the top, so that the amount can easily be read from a scale on the neck of the containers.

How a Cream Separator Works

The cream separator is another machine which has made great changes in the dairy industry. Before it came into use, in comparatively recent times, rows and rows of shining pans filled with milk stood on the shelves of the dairy house for 24 to 36 hours, until the cream rose and could be skimmed off by hand. In modern dairies and creameries separation is done in machines which will handle 2,000 pounds of milk or more in an hour, and do it so efficiently that less than one-tenth of one per cent of the butter-fat is left in the milk, whereas the old method left from one-fifth to one-third. Often the farmer has a small cream separator right on the farm. The skim-milk can then be fed to the calves and other farm stock while it is still warm and fresh, and the farmer saves a great deal of trouble and expense in hauling the whole milk to the butter factory and hauling back again his share of the skimmed milk.

The cream separator works on the principle that the heavier a whirling body is, the greater its tendency to fly from the center. From a tank at the top the milk flows down into a large bowl or drum, which makes from 5,000 to 9,000 revolutions per minute. The cream, being lighter, stays in the center and is drawn off by a tube. The heavier skim-milk, flying to the outside, is carried away by another tube.

THE CONTENTED LIFE THAT BRINGS RICH MILK AND CREAM

Abundant pasturage, clean water, and freedom from annoyance enable cows to produce their best. The good dairyman always remembers that everything which makes his cows happier and healthier means better milk for human children.

WHERE CLEANLINESS MEANS HEALTH

GIVING THE COWS A GOOD HOME

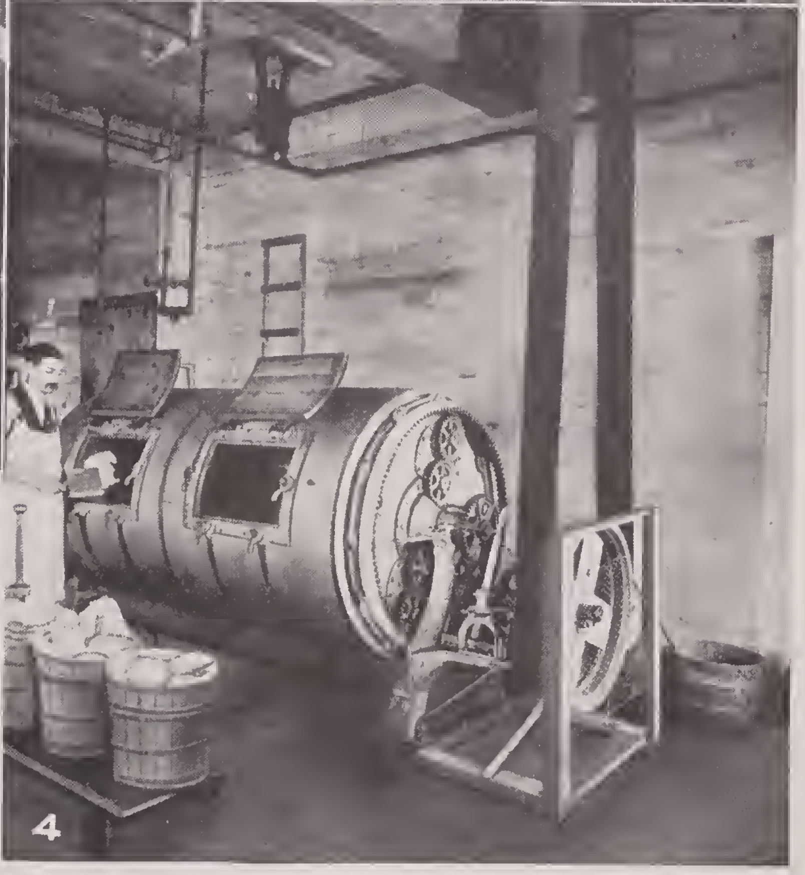
After seeing to it that his cows have good pasture, the modern dairyman turns his attention to the stables. Here everything must aid in keeping the animals clean, for this protects the milk. Notice how the stalls at the left (1) have iron partitions instead of wood, for iron is easier to keep fresh and clean. Below (2) we see an ideal modern "cow hotel" at milking time. The floors are spotless, the men are dressed in white, and are expected to look always neat.

2

3

TURNING CREAM INTO BUTTER

The milk of the different breeds of cows, and even different individual cows, differs a great deal in the amount of butter-fat it contains, and various states specify by law the minimum amount of butter-fat permitted in milk sold. Here (3) we see a dairy expert dipping a sample from a vat before bottling for the market. For butter-making the milk passes to the separators that extract the cream. This cream then goes into immense churns like the one at the right (4), which are run by machinery and turn out butter of standard quality. These churns hold 800 pounds of milk at a time. During the whole process of butter-making the temperature of the rooms and of the machinery is carefully regulated.



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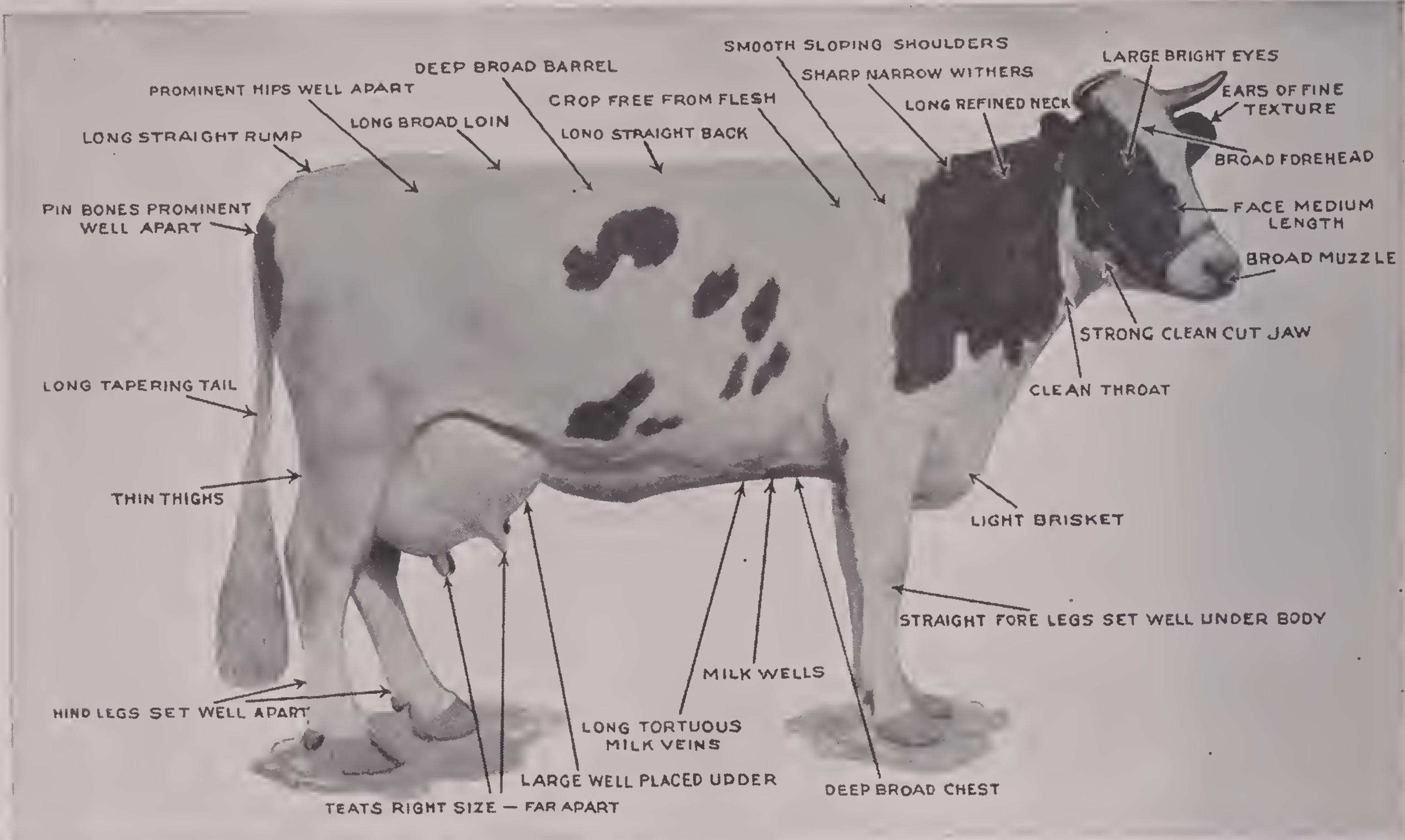
HOW TO PICK A GOOD DAIRY COW



Here you see the points the wise dairyman watches for when he is buying his cows. Careful attention to them will build up a herd giving much better milk than the herd selected on the "hit-or-miss" basis. This picture is the portrait of a prize-winning Holstein cow that produced 28,448 pounds—over 14 tons!—of milk in a year.

At the butter factory payment is made for the cream according to the proportion of butter-fat. The scientific butter-making of the modern factory differs widely from the old-fashioned home manufacture. From the weighing tank the tested cream is piped into a tank called the starting tank. There it is warmed and a little sour curd may be added as a "starter," so that the cream may be ripened or soured in a shorter time. Huge churns turned by machinery take the place of the old dash churn or barrel churn worked by hand. After the butter "comes," the buttermilk is drawn off, and the butter is washed in cold water. It is then pressed and worked to remove the excess water, and to mix in salt. Coloring is usually also added. One pound of butter contains the butter-fat from about two quarts of cream. "Renovated" or "processed" butter, sometimes seen on the market, is made by working over low-grade butter or butter which has lost its fresh sweet flavor. (*See* Butter.)

Cheese factories buy the whole milk for manufacturing (*see* Cheese). The first dairy factory was a cheese factory built in New York in 1860. The industry soon spread over the United States and Canada and the American system of dairying was introduced even in European countries. Practically all the cheese made in the United States is now factory-made, but much more than half of the butter is still made in the farm dairy and used locally. The factory system, where the cream from hundreds of cows can be handled by one skilled butter-maker, produces a superior product. Practically all of the butter in the city market is factory butter and it is sent great distances in cold storage.

The Milk for City Customers

Supplying fresh milk and cream to city customers is an important industry in itself, and one on which depend the lives of countless little babies and the health of many older persons. The bottling is sometimes done on the farm by small bottling machines, but more often in large plants at the point of shipment or in the cities. Special trains with refrigerator cars bring milk to large cities from a distance perhaps as great as 400 miles. Each dairy company purchases its milk from a number—perhaps hundreds—of dairy farms. The milk is carefully strained and run through a machine somewhat like a cream separator to receive impurities. At the same time a part of the butter-fat, in excess of the three per cent usually required by law for whole milk, is separated and sold in the form of cream.

Great care is necessary in handling milk to maintain clean and sanitary conditions, for bacteria develop very rapidly and may be the cause of spreading disease. If the cap on your milk bottle reads "certified" you may know that it is a product of one of the very best dairy farms in the country, for only those farms regularly visited by milk inspectors and found to be maintaining healthful sanitary conditions are permitted to use such a cap. The dairy herd is regularly inspected and a cow showing any tendency toward tuberculosis or other disease is removed from the herd. Special care is given to their feeding so as to keep the herd in good health, maintain a large milk production, and protect the milk from taint of rank weeds or other objectionable matter. The dairy barn of the "certified" milk producer must be well ventilated and well lighted. The walls, ceiling, and floor are frequently and thoroughly cleaned. The employees must be healthy and trained in cleanliness. In brief, the dairy barn is looked upon as a place in which human food is prepared and not merely as a shed for cows.

Before each milking the cows are curried and cleaned, and milkers in fresh white suits draw the milk into covered or small top pails, to exclude all the dirt possible. Milking machines greatly reduce the labor and give added cleanliness. The milk is at once taken to a clean room, strained, clarified, and cooled to a temperature of 40° or 50° F., at which temperature bacteria do not readily develop. The milk is then bottled and capped on the farm, and is ready for delivery. Certified milk is purchased especially for infants and invalids, and costs nearly twice as much as milk which does not come up to this high standard of cleanliness.

Milk produced with less care may contain harmful bacteria, so it is usually "pasteurized"; in fact in many places pasteurization is required by law. This is done by heating the milk to a temperature of from 130° to 160° F. and keeping it at that temperature for from 10 to 30 minutes to destroy the harmful bacteria, after which it is cooled rapidly to a temperature of 40° or 50° F. to check any new development of bacteria.

Wisconsin is the leading dairy state in the United States in the total value of its dairy products, including cheese. New York is second in total production, and first in the direct sale of fresh milk and cream. Other important dairying states are Pennsylvania, Illinois, Iowa, Ohio, Minnesota, Indiana, Michigan, Missouri, and Kansas; but dairying can be carried on with profit in almost any section of the United States. Canada is noted for the quality of butter and cheese produced in that country. Denmark has long been a great dairying country, exporting nearly 200,000,000 pounds of butter from an area one-third the size of New York. Australia also exports large quantities of dairy products.

DAISY. Rippling in the breeze and gleaming and sparkling like a snowdrift in the June sunlight, a field of starry white daisies is one of the fairest scenes painted by nature. From May until November their beautiful wheel-like blossoms of gold and white brighten the meadows and nod from the roadsides. Especially in June is their glory a joy to every flower lover, and a delight to the American school child, who weaves the blossoms into wreaths and chains or tells fortunes with the petals.

Familiar though it is to us today, the daisy grew in Europe and Asia long before it made its home in the New World. The name daisy, or "Day's eye," was given to the flower centuries ago by the English, who saw in its yellow disk a miniature sun with white rays. Tradition says that it nestled in the hay brought from Germany to feed the horses of Burgoyne's army. It quickly became naturalized, increasing a thousand fold, spreading throughout the United States and Canada.

The black-eyed Susan, sometimes called the ox-eye or yellow daisy, belongs to a different species. Quite different, too, from our common daisy is the blossom that hugs the British turf—the "wee, modest, crimson-tippit flower," of which the poet Burns sang, which folds up its ray-florets at sundown, and opens them again at dawn.

"THE BEAUTY OF THE FIELDS"

When you see fields covered with beautiful flowers, like little suns, of white and gold, you know they are daisies.

Scientific name of common daisy, *Chrysanthemum leucanthemum*. Flowers from 1½ to 2 inches across growing singly on end of stem; 20 to 30 long, white slightly creased rays, radiating from a yellow disklike center composed of densely packed tubular florets. Stems, 1 to 3 feet long, smooth, erect, and rarely branched. Leaves oblong, and close to stem. Scientific name of black-eyed Susan, *Rudbeckia hirta;* English daisy, *Bellis perennis.*

DALLAS, TEX. With its skyscrapers, its teeming streets, its enormous railway yards, and its great factories, Dallas, the leading manufacturing city of Texas, seems like a city of the North set down under the gracious skies of the South. Like many Northern cities, too, it has had an amazingly swift development, multiplying its population more than 15 times since 1880.

Dallas owes its prosperity to the fact that it is located in the great Black Waxy Belt of Texas, that stretch of rich black loam which is one of the richest agricultural regions in the world. The city is the great distributing point for this cotton, corn, fruit, and wheat country. It is one of the largest inland cotton markets in the world, and is second only to Kansas City in the sale and distribution of agricultural implements. Dallas leads in the manufacture of cotton gin machinery, saddlery, and leather goods, and there are important flour and grist mills, salt works, cement plants and iron and metal works. It is the Federal Reserve banking headquarters for District No. 11, including Texas and parts of New Mexico, Oklahoma, Louisiana, and Arizona.

More than one-third of the population of Texas reside within a radius of 100 miles of Dallas. This fact and the agricultural richness of the surrounding territory have aided in making the annual state fair at Dallas one of the most successful of its kind in the world. Although it is called a state fair, it is purely a local enterprise, and is exceptional in that it has never received state or federal aid. The fair grounds, with their 162 acres, have been turned over to the city by the Fair Association as a park except for the month the fair is held.

The business district is clean and attractive, and the residential sections are beautifully laid out, with many beautiful parks. Leading educational institutions are the Southern Methodist University, Dallas University, and the Baylor Medical College. The city was incorporated in 1856, but its real development began when the railroads reached it, in the early 70's. Dallas adopted the commission form of government in 1907. Population, about 160,000.

ST. PAUL FLEEING FROM DAMASCUS

It was while going to Damascus to persecute the Christians that St. Paul, who was then called "Saul of Tarsus," saw the vision which converted him. Arrived in the city he preached the Christian faith. The Jews in their fury plotted to kill him, but his disciples lowered him from the walls in a basket at night, and he escaped.

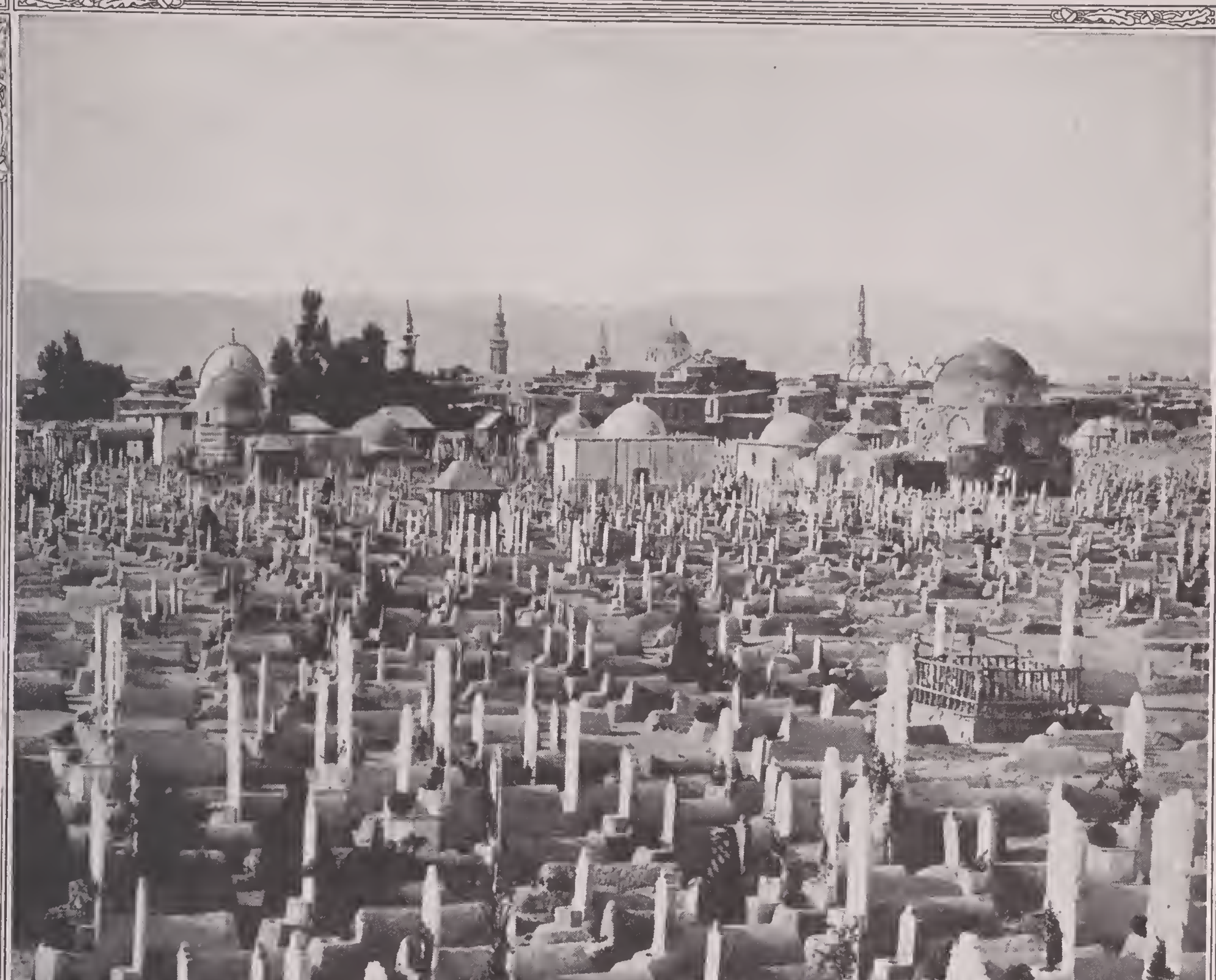
DAM. Any barrier built across a watercourse to hold back and store the water is called a dam. The principal reasons for building dams are to create reservoirs for the water supply of cities, to store water during wet seasons for irrigation during dry seasons, to back up the flow of streams so they will be deep enough for navigation, or to create a "head" for water-power plants.

Though dams may be built of earth, or earth and timber, or stone masonry, the highest are made of concrete reinforced by steel. One of the highest in the world is the Shoshone irrigation dam built by the United States Reclamation Service across a narrow canyon of the Shoshone River, near Cody, Wyoming. It is 328 feet high, 108 feet thick at the bottom, and 10 feet thick at the top. To give it the added strength of the arch formation, it curves upstream like a giant horseshoe. This formation is typical of such great dams as the Roosevelt, Pathfinder, and Sweetwater dams. Many dams are built with movable sections or gates which may be opened or closed at will.

A "coffer-dam" is a tight inclosure built in any body of water, so that it may be pumped dry to allow the foundations of a bridge, quay, or other structure to be put in. It is generally made of piles.

DAMAS'CUS, SYRIA. Before Athens was built or Rome; before Moses led the children of Israel out of Egypt, Damascus, "the pearl of the desert," was a great and famous city. It is believed to be the oldest inhabited city in the world, and we can trace its continuous existence for 4,000 years. To the Arab it is also the most beautiful city, and on it he patterns his idea of Paradise; for it lies in a lovely green plain on the edge of the Syrian desert, and its gardens—stretching for miles along the Barada River—yield oranges, lemons, citrons, pomegranates, mulberries, figs, plums, walnuts, pears, apples, and cucumbers, to the limit of his dreams. It is a sacred city as well, and in the 12th month of every Mohammedan year, thousands gather at Damascus for the pilgrimage to Mecca which every believer hopes to make once in his lifetime. About this city of romance many historic memories cluster — how it was taken by the Israelites under King David, and by the Assyrians under Tiglath-Pileser III; how Paul was miraculously

THE "CITY OF THE DEAD" IN DAMASCUS



This is the modern cemetery of the ancient city on the Barada River. To many it might seem strange to call this cemetery "modern," since the wives of Mohammed and his daughter Fatima are buried here. But compared with Damascus' 4,000 years of history, the time that has elapsed since Mohammed is relatively short. The graves are interesting because of their peculiar form, the uniform style of headstone, and the recess for flowers in each stone. Although different in many respects from Christian interment, burial among the Mohammendans is equally ceremonious. The body is interred quickly, without a coffin, and mourners guard the grave until the headstone is set up. Thereafter female relatives of the departed visit the grave frequently.

TALKING POLITICS AND HIGH PRICES IN DAMASCUS

It is a far cry from this sidewalk café in distant Damascus to the general store of an American cross-roads village. But the idea is just about the same. Instead of discussing the price of corn and hogs, these dark-skinned gossips are probably telling each other about the shortage in camels, while they puff on the "hookahs" or water-pipes.

converted while on his way to persecute the Christians of Damascus; how it was captured by the Crusaders. Here died Saladin, the great enemy of the Crusaders in the days of Richard Cœur de Lion, and here he lies buried.

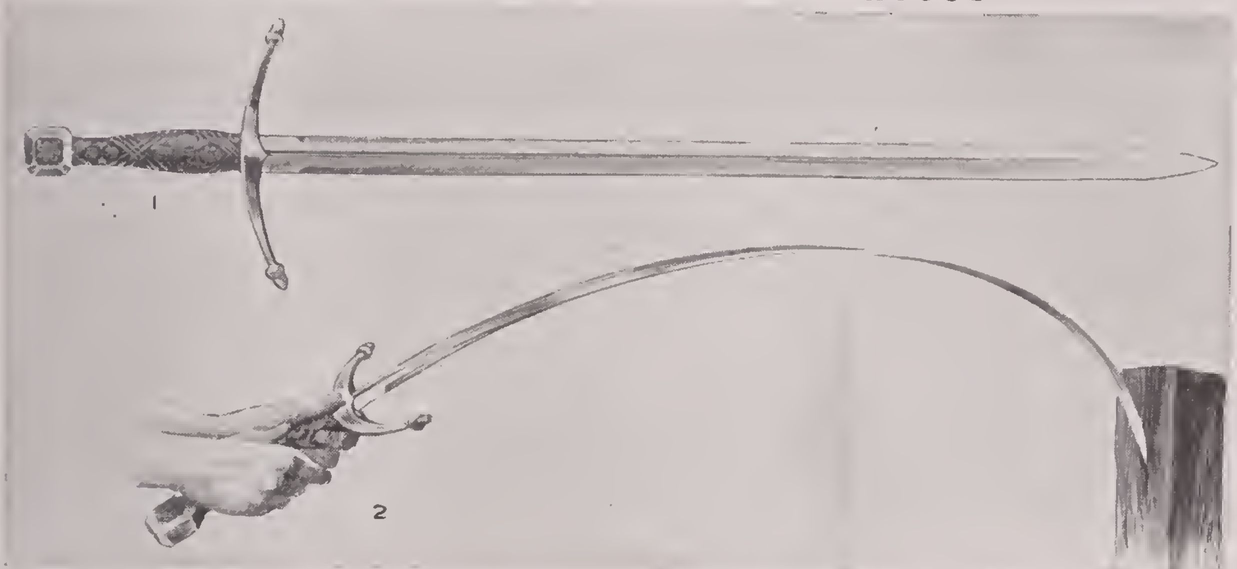
No city is more oriental in appearance than Damascus. From a distance its great expanse of low-lying Arab houses, overtopped here and there by the graceful minarets of the 248 mosques, seems very picturesque; but when you come nearer, you find that the streets are narrow and crooked and dirty, and the houses seem very dingy and dilapidated. But their mud fronts and grated windows with red shutters give no indication of the luxury of some of the interiors, where you find rich rugs and draperies, striped divans, and marble-paved courts with fountains.

The life of this merchant city of the desert centers in its khans and bazaars. The "great khan," with its Moorish gate and its black and white marble cupola supported on granite pillars, is a magnificent structure. In this and several lesser khans (walled caravan headquarters), trading goes on in a cool twilight to the pleasant sound of fountains. The bazaars are noisier and busier, being simply streets of shops hardly bigger than a bootblack's parlor, where bright silks, rugs, metal work, fruits, roast meats, confections sweetened with honey and grape syrup, shoes, cloth, and other articles are temptingly displayed. Each kind of goods has a street or part of a street to itself. The longest and busiest bazaar of all—the "Straight Street" mentioned in connection with St. Paul's conversion—is roofed for its whole length of a mile and a half, and as seen from some minaret looks like a great lead pipe running through the midst of the city. Up and down the bazaars go vendors of ices, sherbets, and cooling drinks.

The looms of Damascus have been famous for many centuries; and in this city, where everything is still done in the most primitive way, where meal is ground in stone mills turned by camels, you may still see the hand looms worked by a weaver and his draw-boy. On these looms are made the beautiful damasks, woven in silks of brilliant colors, that were known throughout Europe and Asia as early as the time of the Crusades. (*See* Cloth.)

Few of the Damascus blades, for which Damascus was also famous in the Middle Ages, have been forged there since 1399, when Tamerlane, the terrible Tatar conqueror, raided the city and carried off all the great armorers to his own capitals. These blades were so keen that you could cut floating gossamer with them; so hard that they would shear an iron spear in two as if it were a reed; and so elastic that they would bend to a right angle and then spring back as straight as ever. The twisting and welding of two grades of iron or steel gave them their cutting properties and also contributed a beautiful watermark pattern. To make them still more beautiful the Damascenes inlaid them with marvelous designs done in gold and silver. Damascus today is still famous for this exquisite inlay work in metals.

THE FAMOUS "BLADES OF DAMASCUS"



Like the swords of Toledo, Spain, the Damascus weapons have long been celebrated the world over for their exquisite workmanship, razor-sharp edges, and perfect temper. The method of making them left a peculiar pattern on the surface of the metal, and today steel which wears this pattern is everywhere known as Damascus steel.

The first mention of Damascus is in Egyptian records of about 4,000 years ago. After 1200 B.C. it became the most powerful of a group of Aramean kingdoms that long defied Assyria. In 732, however, Tiglath-Pileser III crushed its walls. The Bible tells of David's conquest of Damascus. In 333 B.C. it fell prey to Alexander, and in 63 A.D. to Rome. From 635 down to the time of the World War Damascus was in Arab and Turkish hands, except for a brief interval when it was held by the Crusaders of the 12th century.

DAM'OCLES. The uncertainty of human happiness is illustrated by the story of Damocles, who was one of the courtiers and flatterers of the elder Dionysius, tyrant of Syracuse, in Sicily, in the 4th century B.C. According to the story, Damocles once extolled in the highest terms the grandeur and happiness of the king, and was reproved in a singular way by Dionysius. He was placed at a magnificent banquet, surrounded by all the splendors of royalty. In the midst of his enjoyment, suddenly looking upward, he saw a naked sword hanging by a single horsehair above his head typifying the uncertainty of a ruler's life. The "sword of Damocles" has thus become a proverbial expression for uncertainty and danger.

DAMON AND PYTHIAS. The world has no more beautiful story of friendship than that told in ancient times of Damon and Pythias. Pythias (or, more properly, Phintias) because of his opposition to Dionysius, tyrant of Syracuse, was condemned to death. He begged to be allowed to return home to bid farewell to his wife and child. Damon came forward and offered himself as surety for his friend, promising to die in his stead if Pythias did not return.

The time of execution approached. Pythias had not come and Damon was already at the place where he was to die when Pythias suddenly rushed through the crowd into his arms. His horse had been killed, and it was only through an almost superhuman effort that he was able to arrive in the nick of time. Then each of the friends pleaded to be allowed to die for the other. Dionysius was so moved that he pardoned them both and begged that he might be allowed to share in their marvelous friendship.

The Knights of Pythias, a fraternal society, founded at Washington, D.C., in 1864, takes its name from the Pythias of this charming story from ancient Greece.

DAN'DELION. A welcome sight in the early spring are the first bright blossoms of this—

> Dear common flower that grow'st beside the way,
> Fringing the dusty road with harmless gold.

Although abhorred by the diligent gardener as a troublesome weed, the dandelion is a delight to the children who make curls and ribbon chains of its long hollow stems, and to the housewife to whom it supplies healthful "greens," prepared in much the same manner as spinach.

The dandelion is a native of Europe and Asia, but has become naturalized throughout all temperate regions. It is a member of the chicory family. The root is long and bitter, and when ground and roasted is at times used as a substitute for coffee. The leaves are long and irregular, with jagged points inclined towards the stem and so arranged that rain easily finds its way to the roots. Each golden flower is composed of innumerable tiny florets, held in a cup of green and set singly on the tip of the stem. Bees, wasps, butterflies, beetles, flies, and hundreds of other insects visit it for its abundant supply of nectar and pollen. The blooming season lasts throughout the summer, the brilliant blossoms soon turning to white fluffy pappus balls whose seeds are scattered by the winds, gaining for it the name of blowball.

Scientific name, *Taraxacum officinale.* Flower round, single, of golden yellow, containing 150 or more perfect florets at the top of a hollow milky stem, from 2 to 18 inches tall. Leaves spatulate and irregularly jagged, growing from a deep bitter root.

DANTE (*dän'tā*) **ALIGHIERI** (1265–1321). The Middle Ages were just brightening with the dawn of the Renaissance when Italy's greatest poet—and one of the greatest of all lands and times—was born in Florence, of a family belonging to the lesser nobility. As with so many other great men, a halo of legends surrounds his early life, but the essential facts are told in his book entitled 'Vita Nuova' (New Life). When only nine years old he met the Beatrice of his later poems and formed a passion for her which never cooled and which influenced the whole course of his later life.

Dante's education gave him a mastery of the Latin learning of that day, and as a citizen of one of the chief of the little city-republics he played his part in the political and military conflicts—primarily those of the Guelfs (party of the Pope) and Ghibellines (party of the Emperor)—which were tearing all Italy to pieces. He rose to high office in Florence, and was sent on an embassy to the Pope at Rome in 1301. When the victory of the more extreme party in Florence (the Black Guelfs) resulted in the banishment of the leaders of the opposite party (the White Guelfs), Dante was included (1302); and later he with others was condemned to be burned alive if caught.

The remainder of the poet's life was spent in bitter exile. He himself says: "Through almost all parts of Italy, a wanderer, well nigh a begger, I have traveled, showing against my will the wounds of fortune." His sympathies now were entirely with the Ghibelline party, and he looked—though in vain—to the Emperor in Germany as the source from which unity and order should come to cure the anarchy of Italy. He died in 1321, in Ravenna, a quaint old Italian city situated among the lagoons of the Adriatic some distance south of where the River Po enters that eastern sea.

There in a marble urn still repose the poet's bodily remains, beneath a tomb which the poet Byron calls "a little cupola more neat than solemn." The portrait by his Florentine friend Giotto preserves for us his features as they were before the cares and sorrows of exile had left their marks upon that noble countenance. But his true monument, known and loved by poets, artists, and scholars everywhere, is his immortal poem, the 'Divine Comedy'.

No work in the world except the Bible has given rise to so much literature. It was copied in 600 different manuscripts before the invention of printing, and about 300 printed editions have been issued. It has been more than 300 times translated into foreign languages; and unnumbered introductions, essays, and commentaries have been written on or about it. Dante had not been in his grave 20 years before Italy instinctively recognized that this was her greatest man. About 50 years after Dante's death a public lectureship on the 'Divine Comedy' was established at Florence, to which the first appointee was Boccaccio the founder of Italian prose, as Dante was of Italian poetry.

The Story of Dante's 'Divine Comedy'

TO English-speaking peoples the poet Dante is the least known of "the five" that, as Emerson says, "the centuries do survive." This is not because he wrote in Italian, for Homer wrote in Greek and we all know the stories of the 'Iliad' and the 'Odyssey'. But the matters that Dante deals with are of a less popular character; and those who are able to read his 'Divine Comedy' in the original say that much of his sublime harmonies of sound and sense is lost in translation. Still, the best renderings of this classic into English blank verse do preserve the grandeur of theme and style, and many a passage of matchless beauty.

This classical work of literature probably could have been written in no other country than Italy, and at no other period in history than in the beginning of the 14th century. The splendors of the age of Catholic faith were not yet past; the rich and towering Gothic cathedrals were still slowly building; the last of the Crusades was barely over with, and the medieval universities with their subtle learning in law and theology were at the height of their fame and influence. Although Dante preceded Columbus by nearly two centuries, his age, especially in the city of Florence where he was born, was one of superior men, of free thought and speech, of original genius, and adventurous undertakings.

The time was favorable for the appearance of a great imaginative work of literature of the most daring form and conception. Discarding Latin, in which all important writing was still done, Dante used the Italian of his native Tuscany, at that time almost as rude and unformed a literary tongue as was English in Chaucer's day. He chose a new theme, invented his own style, and raised Italian to the dignity of a literary language.

While the 'Divine Comedy' is written in the grand manner, it does not deal with the events and characters of heroic story, and so does not fall within the definition of an epic. Neither is it strictly allegorical, as is Spenser's 'Faerie Queene'. Dante himself said of it: "The subject taken literally is the condition of souls after death; but taken allegorically the subject is man, how by merit or demerit he justly deserves rewards or punishments." It might be described as a spiritual 'Odyssey'. The hero of his mystical adventures was the poet himself, the actors were mainly historical characters known to the audience for whom he wrote, and moral discourses take the place of episodes.

The 'Divine Comedy' is a descriptive narrative of an imaginary journey through "the world of souls," of Hell, Purgatory, and Heaven. Beginning on Good Friday of the year 1300 and ending on the Sunday after Easter, the time of action covered by one of the longest and most dramatic poems ever written is only ten days. In learning, invention, and imaginative powers the 'Divine Comedy' has never been surpassed. From one startling scene to another the poet

THE SHADOWY SPIRITS OF THE MOON

After his visit to the Inferno and Purgatory, Dante encounters the spirit of his beloved Beatrice, and by her is conducted through Paradise. Their first visit is to the Moon, where Dante perceives the shades of many beautiful women. Beatrice smilingly bids him speak with one, and from her he learns that this portion of Paradise is set aside for nuns forced against their will to marry. As an example, his informer points out Constance, daughter of the King of Sicily, who was taken by force and compelled to marry the Emperor Henry VI.

passes, reviewing rapidly the processions of shades from classical mythology and centuries of history, and with the certainty of one so wrapped in his visions as to make them the only reality. We see the souls of the dead as he saw them, in torment, or floating like golden bees in the azure from star to star. As the French critic Taine says: "His cries of anguish, his transport of joy, the succession of his infernal or blessed phantoms, carry us with him through that invisible world."

DANTE AND BEATRICE

The Italian poet's love was hopeless, because Beatrice was married to another. He cherished it however, and it inspired much of his beautiful poetry.

When the action begins, Dante is lost in a forest, with his upward way barred by wild beasts. This is understood to be symbolic. The beasts were the sins which keep us from our desire for a holier life. To help him with reason and repentance, the shade of the poet Vergil appears and guides him through the lower regions of the next world. Taken across the River of Death in his sleep by the grim ferryman of lost souls, Dante awakes on the brink of Hell. Here he is obliged to pass through a gate above which is cut the terrible inscription:

> Through me you pass into the city of woe.
> All hope abandon ye who enter here.

The Inferno or Hell of Dante's vision is a vast conical abyss which, by narrowing terrace-like ledges or circles, separated by steep descents, reaches to the center of the earth. As every lost soul is punished according to his sin, the wickedness and torments increase with the descent. From the moral pagans of ancient days, who dwell in the highest circle and who sorrow without suffering because they knew not the Christian God, the poet goes down to the foul black abode of brutish crime. The way is so long and steep that only on the back of a monster may he and his guide reach the lowest pit. There lurks infamy so unbelievable that pity for those in eternal torment is turned to loathing. Climbing down the rugged limbs of Satan, who stands at the very bottom like a colossal statue, the two visitors escape through a crevice which leads back to the surface of the earth.

On Easter morning they emerge at a point on the earth's surface opposite to the holy city of Jerusalem—

> Till on our view the beautiful lights of heaven
> Dawned through a circular opening in the cave:
> Thence issuing we again beheld the stars.

Longfellow's translation has this lovely passage:

> The dawn was vanquishing the matin hour
> Which fled before it, so that from afar
> I recognized the trembling of the sea.

In the midst of this antipodal ocean stood the mountain of Purgatory—

> The mount that rises highest o'er the wave.

On its seven-terraced slope dwelt the souls of those whose lesser sins might be overcome and atoned for. Rough stairways cut in the rock let the visitors ascend from terrace to terrace, where quiet shades lived in penitence and prayer, to the earthly paradise on the summit.

This was screened by a thick forest which clothed the higher slopes. A serene place of sweetness and peace, there is a charming description of how a light breeze blows through it, turning all the leaves one way, and the gentle rustlings mingled with the songs of the birds.

Like the poet himself the reader is in a state of breathless expectancy. To understand the happiness that awaits him, you should know that in his first book, 'Vita Nuova' (New Life) Dante had celebrated the beauty and virtues and confessed his deathless love for a lady named Beatrice, who had died young. At the end he had expressed the hope that he himself would not die until after he had written of Beatrice such things as had never yet been written of woman.

In the 'Divine Comedy' Dante immortalized the lady of his worship, and set her up above all his desires. In the forest which hid the earthly paradise on the summit of Purgatorio, a sheet of flame suddenly barred his path. When Dante started back in alarm, Vergil had only to whisper that Beatrice waited beyond the fiery wall, and Dante leaped through it. A vision of celestial purity and sweetness, Beatrice appeared, descended from her home in the ninth heaven to be the poet's guide through Paradiso. Taking him by the hand she floated upward with him, "from star to star."

Degrees of Happiness in Dante's Heaven

According to the religious belief of the day, heaven was composed of mounting degrees of bliss, each located on some sphere of the celestial system of which the earth was supposed to be the center. The sun and moon and five of the planets were abodes of the redeemed. As Vergil had led Dante down through the abyss of Hell and up the slopes of Purgatory, so Beatrice transported him through the blue ether and roamed with him over the worlds of ineffable happiness which make up Paradise. As they were rising to the eighth sphere or firmament, the celestial guide bade him cast his view below and look upon the earth:

Look down, once more, and see how vast a world
Thou hast already put beneath thy feet.
. . . .
I, with my sight, returned through one and all
The sevenfold spheres, and I beheld this globe
Such that I smiled at its ignoble semblance.

In the ninth circle dwelt the hierarchy of angels who guarded and hid the mysteries of the Deity. In a vast amphitheater, whose circles of thrones rose and widened to infinity, sat the souls of those who had died without sin. Here Beatrice left the poet, seating herself remote from him on her own throne—

. . . . and she so far away
Smiled, as it seemed, and looked once more at me;
Then unto the Eternal Fountain turned.

As a mortal visitor Dante might not himself go into the Empyrean, but for a moment his heart was flooded with understanding of the glory of God and the beauty of holiness. The poem ends with these lines of noble submission—

But yet the will rolled onward, like a wheel
In even motion, by the love impelled
That moves the sun in heaven and all the stars.

DANTON (*dän-tôṅ'*), GEORGES JACQUES (1759–1794). "I am Danton, sufficiently known in the Revolution. I shall soon pass to nothingness, but my name will live in the Pantheon of history." This was the reply of the great leader of the French Revolution when asked his name by the court which condemned him to death.

For two years, 1792–94, he had been guiding and controlling the destinies of France. When the country had been threatened by outside foes, he had aroused his countrymen by his famous cry: "We must dare, and again dare, and dare without end." And, inspired by this bugle-call, they had driven the Austrian invader from their soil. Along with Marat and Camille Desmoulins, Danton had founded the Cordelier's Club, which soon became the rallying-point of all the hotter revolutionists.

The man who thus became the leader of the people of Paris had not an attractive appearance. His face was pitted with smallpox, and he described himself as having "the athletic shape and the stern visage of the Liberty for which he was ready to die."

An able and eloquent lawyer, he was inspired by an ardent patriotism which he managed to communicate to others. Although an extreme republican, he was anxious to keep all Frenchmen working together for the good of the country. When the aristocrats and *émigrés* (emigrant nobles) persisted in opposing the cause to which he devoted his life, he with Marat and Robespierre inaugurated the Reign of Terror, which was carried out by the Revolutionary Tribunal.

When invasion was repelled and royalist uprisings put down, Danton was the first to advocate that the system of Terror be abolished. The need for it was then past, in his opinion. His associate Robespierre, unwilling to sacrifice any of his power for the good of the country, decided that Danton should be brought before the Revolutionary Tribunal and condemned to death. St. Just, a member of the Committee of Public Safety, denounced Danton, and because of the inflamed passions of the time, the great leader's doom was certain.

A friend of Danton's urged him to resist arrest, but he replied: "That means the shedding of blood, and I am sick of it. I would rather be guillotined than guillotine." When urged to flee, he said: "Whither flee? You do not carry your country on the sole of your shoe." Before he was executed he declared, "A year ago I proposed the establishment of the Revolutionary Tribunal. I ask pardon for it, of God and man." His fame remains secure as one of the ablest as well as noblest of the iron leaders of the Revolution which overthrew the old monarchy in France.

DANUBE (*dăn'ūb*) **RIVER.** In a pleasant little valley of the Black Forest—a northern spur of the Alps—a tiny stream comes tumbling down the rocks and, gathering volume and strength from many springs and rivulets, cuts a channel across the sunny slopes and spreading hayfields of south Germany. This little stream, the Brege, with its twin sister, the Brigach, is the source of the Danube, the greatest river of Europe next to the Volga. The Danube has been since earliest history a great water highway, connecting and dividing varied and interesting nationalities, gathering the waters of more than 300 tributaries, and draining one-tenth of Europe in its course of 1,750 miles from the southwest corner of Germany to the Black Sea. A canal 108 miles long binds it to its sister river the Rhine by connecting its tributary the Altmühl with the River Main. So close are the headwaters of the Danube, draining to the Black Sea, to the course of the Rhine, running to the North Sea, that it is often said that the deflection caused by a single pebble might determine the destiny of a raindrop falling on the dividing highlands.

Once a Roman frontier, the Danube through passing centuries has been in turn the highway of westward-moving Huns, Slavs, and Magyars; a barrier and a goal for Russian, Austrian, German, Bulgarian, Turkish, and Rumanian armies, and the channel of eastward- and southward-flowing German culture and influence. Great states, great men, and great cities have flourished on its banks, and the Danube alone remains unchanging and untroubled.

In its course across southern Germany it is not yet the "beautiful blue Danube" of song, but a rushing stream hurrying along among wooded hills and fertile meadows, past picturesque Bavarian towns. At Ratisbon, the most northerly point of its course, the Danube is lively with tow-boats, barges, and rafts busied with the commerce of grain-growing Bavaria. Soon the Bohemian hills edge down to the river and deflect its course to the southeast to Vienna.

Then a 30-mile journey brings one to Pressburg and the edge of the rich plain (Alföld) of Hungary, checkered with growing crops. In fertile valleys white-walled villages shimmer in the sunlight among yellow fields of ripening grain. One now hears the musical Magyar tongue, and sees a new type of face, suggesting a warmer sun, a longer summer, and habitual out-of-door life. After serving for almost 100 miles as part of the boundary between Czecho-Slovakia and Hungary, the river makes a great bend and begins its 500-mile journey due south.

At Budapest imposing bridges span the Danube's course, while below the city laughing groups of women stand knee-deep in its shallows beating clothes with wooden mallets. Tree-embowered villages nestle long distances apart at the foot of vineyard-clad slopes. Occasionally a group of fishermen's huts is passed, and miles of nets drying in the sun. Canals contribute their burden of huge cargoes of grain and lumber from the Hungarian plains. Then on past the junction of the eastward-flowing Drave and Save and the great southward-flowing Theiss with the Danube, to where stands fateful Belgrade, Serbia's capital. Here the mighty river, again heading east, spreads out like a wide lake, with the little white homesteads of the Serbian peasants dotting its shores.

A hundred miles farther on one comes to the black beetling cliffs of the Kazan defile, where the Danube narrows to 160 yards and there is almost twilight gloom. A long gash in the face of the almost perpendicular rock walls tells of the road Trajan's warriors built on the way to found the colony of Dacia, Rumania's ancestor. Just below, the river gathers all its force and batters its way between the Balkan and Carpathian ranges through the historic gorge known as the "Iron Gates" or Orsova. The commercial importance of the Danube necessitated the blasting of a channel here, deep enough to allow river steamers to pass the mile and a half of rapids at all seasons.

As though exhausted by the storming of the Iron Gates, the Danube from Orsova on winds sleepily through a peaceful countryside separating Rumania from Bulgaria—its monotony broken only by an occasional fishing hamlet or straggling half-Turk, half-Bulgarian, or half-Rumanian towns. Beyond Silistoria the river turns abruptly to the north, with the swampy Dobrudja on the east all the way to the important ports of Braila and Galatz. Here, 125 miles from the mouth, is the head of navigation for seagoing vessels, so these cities are the shipping centers for agricultural Rumania and other Danubian regions, with great docks and immense grain elevators.

Galatz is the seat of the European Commission of the Danube, established in 1856, which controls the river from Braila to the sea. Forty-five miles below, the river gives off the first of the countless small arms and three chief ones in which it wanders lazily across its triangular delta. In the whole of this great flat there are only a few square miles of sand-dunes higher than the general level of the marsh, and on these fishermen live in rude reed huts. In summer nets are set in every lake and lagoon. In winter when the whole region is frozen, the mails and sometimes passengers are carried across this desolate waste on sledges.

The Danube begins to be navigable for flat-bottomed steamers at Uln, on the borders of the Black Forest. Commerce on the lower Danube, much of it in British bottoms, consists chiefly of wheat, barley, and Indian corn; but petroleum, tallow, hides, salt fish, lumber and wool are exported in large quantities.

DAN'ZIG (*dän'tsik*). Few cities are more interesting to the lover of the rare and curious than this city at the mouth of the great Vistula River, which, with its adjoining territory of more than 600 square miles, was declared a "free city" under protection of the League of Nations in 1919. Its separation from Prussia to form part of Poland's "corridor to the sea" was one of the terms imposed upon Germany in the Versailles peace treaty after the World War of 1914–18.

Danzig is old and its age is stamped on its streets and buildings. In a country almost devoid of stone Danzig was built of stone, with queer decorations, quaint tile friezes, and rich brass work. The most interesting of its memorials of medieval days is the old Crane Tower and Gate, which seems ready to fall at any moment. Within the tower, over the passageway, is a great treadmill where in the old days prisoners were made to walk in order to raise the grain from the ships into the bins above. Across the stream there is an unending line of granaries or warehouses. Another notable old building is the Artushof, built by the merchant princes of the Middle Ages as a clubhouse, with paintings and wood carvings and a torture chamber. Today it is used as a grain exchange.

Danzig, or Gdansk as the Poles call it, has a past that goes back to the glories of the Hanseatic League, of which it was one of the most important members (*see* Hanseatic League). For a century and a half (1308–1466) it was in the hands of the Order of Teutonic Knights, and under their rule it became one of the most notable of medieval commercial cities. Thenceforth until the iniquitous partition of Poland in 1793, it was a Polish city, playing the part to the Vistula that Alexandria does to the Nile. Even as late as 1813 its inhabitants petitioned against union with Prussia; but today nine-tenths of its people are Germans and resent the separation. Danzig is an important manufacturing center with great shipyards, foundries, sugar refineries, and flour mills, as well as a grain shipping port and importing point. Population, about 180,000.

DAPHNE (*dăf'nĕ*). One of the beautiful legends of Greek mythology tells of the nymph Daphne, whom Apollo loved. When he descended to earth to woo her, she fled from him, and prayed to her mother Gaea, the earth goddess, to save her. Through the intercession of Gaea, Zeus turned Daphne into a laurel tree. From that time Apollo made the laurel his favorite tree, and its leaves were sacred to him. Winners in the Pythian games were crowned with laurel, and great poets, who were also under Apollo's protection, thought the laurel crown the highest honor they could attain. Even today in England the official poet of the reigning king or queen is called the poet laureate.

DARDANELLES (*där-dȧ-nĕlz'*). If you wanted to take the world by the throat and choke it into doing your will, one way would be to hold in your power the narrow channel of the Dardanelles, which separates the two mighty continents of Europe and Asia and threatens Africa. Only a little strait, about 42 miles long and from 1 to 5 miles wide, is the Dardanelles, the gateway to Constantinople. And yet what a wealth of historical and romantic memories cluster about it—memories of ancient Troy that once dominated its southern entrance; legends of Leander who nightly swam the Hellespont (as the Dardanelles were formerly called) to visit his sweetheart, Hero; memories of the hosts of Xerxes crossing the strait by a bridge of boats in 480 B.C.; and of Alexander the Great, 150 years later, leading an army into Asia by the same way. Every promontory and inlet along these shores has an ancient and thrilling tale to tell.

From the island-dotted Aegean Sea, at the eastern end of the Mediterranean, the snakelike channel of the Dardanelles leads into the land-locked Sea of Marmora. From 1841 for many years, by an agreement of the Great Powers of Europe, no war-vessel was permitted to pass this strait without the permission of Turkey. It was long Great Britain's policy to keep the Turk in control of this vital waterway in order to hold Russia back from the Mediterranean. In the World War of 1914–18, when Britain was at war with Turkey, a British force was landed on the Gallipoli peninsula, which forms the European side of the Dardanelles, in the attempt to force the well-fortified strait. After terrific losses it was forced to withdraw about a year later (January 1916). In the peace treaty with Turkey (May 11, 1920) the Dardanelles became part of a neutral "zone of the straits," under the League of Nations.

How DARWIN *Solved* NATURE'S GREAT RIDDLE

WHENCE come the millions on millions of different kinds or species of living beings with which prodigal Nature fills the lands, the air, and seas? To Charles Darwin belongs the honor of first giving a satisfactory answer to this question, one which revolutionized the world's thinking. "None," said his eminent disciple Huxley, "have fought better and none have been more fortunate than Charles Darwin. He found a great truth trodden underfoot, reviled by bigots, and ridiculed by all the world. He lived long enough to see it, chiefly by his own efforts, irrefragably established in science." This article shows something of the long years of preparatory work which went to the forming of the doctrine of organic Evolution.

DARWIN, CHARLES ROBERT (1809–1882). It is a rather remarkable family—two remarkable families, in fact—that Charles Darwin renders illustrious. His father, a successful physician of Shrewsbury, England, was a son of the poet-naturalist, Dr. Erasmus Darwin, and his mother a daughter of the famous potter, Josiah Wedgwood; while Charles' cousin, another grandson of Erasmus Darwin, was Sir Francis Galton, the noted anthropologist.

At school young Charles was considered, he says, "a very ordinary boy, rather below the common standard in intellect." He collected minerals and beetles about as any untaught boy would, "with much zeal but quite unscientifically." The discovery that he "wasted" his time out of school in chemical experiments earned him the nickname of "Gas" from his schoolmates and a severe public reprimand from his schoolmaster.

Two years at Edinburgh University medical school demonstrated that young Darwin was not meant to be a physician, and three happy but aimless and, in his own opinion, unprofitable years at Cambridge University followed as preparation for a clergyman's career. There he came into contact with scientific men, dabbled in entomology, botany, and geology; but he says, "I should have thought myself mad to give up the first days of partridge-shooting for geology or any other science."

Now, within a year of his graduation, occurred the event which was to determine the course of his whole life, namely his appointment as unpaid naturalist to the five-year surveying expedition (December 1831 to October 1836) of the British naval vessel *Beagle* to South American, Australian, and New Zealand coasts and islands. He little guessed, as he gleefully set forth at the age of 22, that he would bring back ideas destined to modify profoundly the whole pattern and fabric of human thought, and make him the most renowned biologist of modern times. To appreciate what this momentous voyage means to us, we must look back and see what the world had been thinking until then.

Scarcely 150 years earlier, Newton had firmly established the idea of invariable natural law supreme over a previously wild and disordered universe (*see* Newton, Sir Isaac). He looked no farther than the mechanism of inorganic nature; but the world welcomed this mechanical principle into every department of thought. Religion particularly claimed for its own the concept of the universe as a mechanism, with parts fitted to each other like the ratchet wheels of a watch. The Creator who made it and set it going might let it run so long as it pleased Him; or He might, like the watchmaker, interfere to regulate it, and this regulation was supernatural intervention. Animals and plants, it was believed, had been created essentially as they now exist, and the fitness of the eye to see, of the ear to hear, of the wing to fly, and of the earth to be the abode of man, proved the intent of the Great Artificer.

Thought about the world's remote past was expected to conform to a literal interpretation of the first chapter of Genesis, and to Archbishop Ussher's chronology, which, piously accepted as practically a part of Holy Writ itself, declared that the world had been created just 4004 years B. C. Some greatly daring minds ventured to surmise that the six days of Creation signified six indefinite epochs. Even so, the young science of geology was much embarrassed to dispose of the evidence of enormous changes in the earth's surface, and plant and animal population, without compromising its religious orthodoxy. But other views, from time to time, were put forth which revived a much older belief in a plastic universe of unceasing growth—of gradual organic change (*see* Evolution). Erasmus Darwin himself was one of those who had rather speculatively suggested—for as yet there was no solid scientific evidence—that the development of one form of life came out of another through generations of gradual change.

What Lyell's Geology Did for Darwin

When Charles Darwin embarked on H.M.S. *Beagle* he took with him Lyell's 'Principles of Geology', published in 1830–33, which a friend had advised him to read but not to believe. Lyell was a "uniformitarian," that is, unlike the then fashionable "catastrophists," he explained the geologic records of the past as due to the operation, over vast periods of time, of processes like those of erosion, sedimentation, gradual elevation, gradual subsidence, etc., going on today. Young Darwin, finding Lyell's theories confirmed by his own observations, became an enthusiastic convert, writing many years later, "I always feel that my books came half out of Lyell's brain, and that I can never acknowledge this sufficiently."

Darwin was deeply impressed, in his explorations, by the resemblances between living animals and extinct fossilized species, by the similarities and differences between animals on islands and those on the nearest continents, and also by the way in which species shade off into each other over neighboring territories. What caused these variations to become—if they did become—stereotyped into species?

He returned to England with overflowing notebooks, with one great insistent question at the back of his brain—and, alas, with permanently impaired health which forbade all thought of a profession and permitted intellectual labor only on condition of the greatest care and economy of strength. Indeed, he wrote in 1841 of the "bitter mortification" he felt on concluding "that the race is for the strong and that I shall probably do little more but be content to admire the strides others make in science."

Yet he was even then in possession of the clue to his great problem. He opened his first notebook on the changes of species in 1837, while still puzzling over the means by which such transmutation is produced in nature. In 1838 he read Malthus' essay 'On Population', and at once the solution—"natural selection," parallel to the stock breeder's artificial selection—flashed into his mind. In the competition between varying forms, those *best fitted to live* in the given environment would survive and perpetuate their kind; the less fit forms would die out.

The Two Great Discoverers of the Great Law

For 20 long years Darwin toiled to perfect the evidence for this theory, discussing it only in private correspondence with a few friends like Lyell, Sir Joseph Hooker, and the American botanist Asa Gray. In 1858, while preparing, at Lyell's insistence, an essay on the subject, he was startled at receiving an outline of the same theory from Alfred Russel Wallace, who had written it (also after reading Malthus!) while ill with fever in the Molucca Islands. With many misgivings as to Wallace's probable attitude, Darwin, on the advice of Lyell and Hooker, prepared an abstract of his work to be read jointly with Wallace's paper before the Linnean Society. The scrupulous fairness of Darwin and Wallace to each other and the warm friendship which ever afterward existed between these rival authors of the evolutionary theory is in the highest degree creditable to both. Darwin insisted that it was as much Wallace's as his own; Wallace declared that credit should be divided between Darwin and himself in proportion to the time each had spent on it—20 years in Darwin's case, one week in his own!

The joint report of Darwin and Wallace attracted little attention. But when in November 1859 Darwin published his great book, 'The Origin of Species', a startled clamor of abuse and praise, misrepresentation and ridicule, broke forth.

It is difficult for us today to understand the feelings of those who in the middle of the 19th century saw in the theory of evolution "a deluge black with destruction, resistless in might, uprooting our most cherished hopes . . . . and burying our highest life in mindless destruction." Bitter suffering was the price paid for advance in scientific thought by men like the naturalist Romanes, who accepted the theory of evolution but felt that with it the universe had "lost the soul of its loveliness." It illustrates the swing of the pendulum with regard to evolution and religion that Romanes lived, not to renounce evolution, but to reconquer religious faith on a new basis, finding God not banished from His universe by the changing form of men's thoughts about Him. Other branches of thought—political and educational theory, psychology and sociology, for instance—were in time penetrated and deeply influenced or transformed by evolutionary theory.

The 'Descent of Man', published by Darwin in 1871, set the capstone on his evolutionary theory. It aroused, not a greater sensation, but fiercer and more stubborn resistance than its predecessor.

A Sick Man's Marvelous Work

These two books, the 'Origin of Species' and the 'Descent of Man', contain the essence of Darwinism, but Darwin's minor contributions to science—on coral reefs, earthworms, climbing plants, etc.—would have been enough to make the reputation of several lesser men. Indeed, the mere amount of his published work is marvelous, considering that "for nearly 40 years he never knew one day of the health of ordinary men," and was able at best to work only about four or five hours a day. "It's dogged as does it," was a favorite saying of his. "I think doggedness expresses his frame of mind almost better than perseverance," writes his son. "Perseverance seems hardly to express his almost fierce desire to force the truth to reveal itself." In a sense, his great work was a gift to the world from two people—his father, whose sympathetic generosity relieved him of the pressure of financial need; and his wife, who by unremitting loving care enabled him to work without annoyance or interruption.

In showy brilliancy Charles Darwin was altogether lacking. He enumerates his deficiencies—slowness of apprehension, limited ability to follow a long and abstract train of reasoning, hazy memory, awkwardness in expressing himself; and he concludes that his success as a man of science, "whatever this may have amounted to," is due to "complex and diversified mental qualities and conditions," of which the most important were "love of science, unbounded patience in long reflecting over any subject, industry in observing and collecting facts, and a fair share of invention as well as common sense"—a sum which, though he does not say so, adds up to make a genius for synthesis, the greatest in our time and perhaps in any. With characteristic modesty Darwin adds: "With such moderate abilities as I possess, it is truly remarkable that I should have influenced to a considerable extent the belief of scientific men on some important points."

For personal fame Darwin cared little, and this was partly the reason why he never replied to attacks. His generous and kindly nature was evidenced in his relations with other writers, with friends and strangers, and even with animals, whose affection he always won. Cruelty seems to have been almost the only thing that could rouse him to anger. His affectionate sympathy with life extended to all natural things. "I used to like to hear him admire the beauty of a flower," says his son; "it was a kind of gratitude to the flower itself, and a personal love for its delicate form and color." When he died, on April 19, 1882, he was buried with honors among England's greatest in Westminster Abbey.

PONDERING OVER THE "SURVIVAL OF THE FITTEST"

For over 20 years the semi-invalid Charles Darwin patiently collected proofs of his monumental idea concerning the origin of species, testing it at every point by reading, inquiring of naturalists, and watching the plant and animal life about him. As a result, his epoch-making book, 'The Origin of Species', abounds with references to his garden, in which he is here shown taking his morning walk.

Darwin's chief publications were: 'The Journal of a Naturalist' (1839); 'Origin of Species' (1859); 'Descent of Man' (1871); 'Formation of Vegetable Mould through the Action of Earthworms' (1881). His 'Life and Letters', edited by his son Francis Darwin, was published in 1887.

DATE PALM. Four thousand years ago this valuable tree was grown and cultivated along the Euphrates and Tigris rivers. Where it was too hot and too dry for other plants to grow, the date palm flourished, and during all these centuries it has blessed the natives with its fruit, its timber, and its cooling shade, under which they live and mature their orchards and vineyards. Many desert parts of Arabia and the Sahara would not be habitable were it not for this tree which grows in their oases, and which is the most important food plant of the great deserts. Egypt alone has more than 5,000,000 bearing date palms.

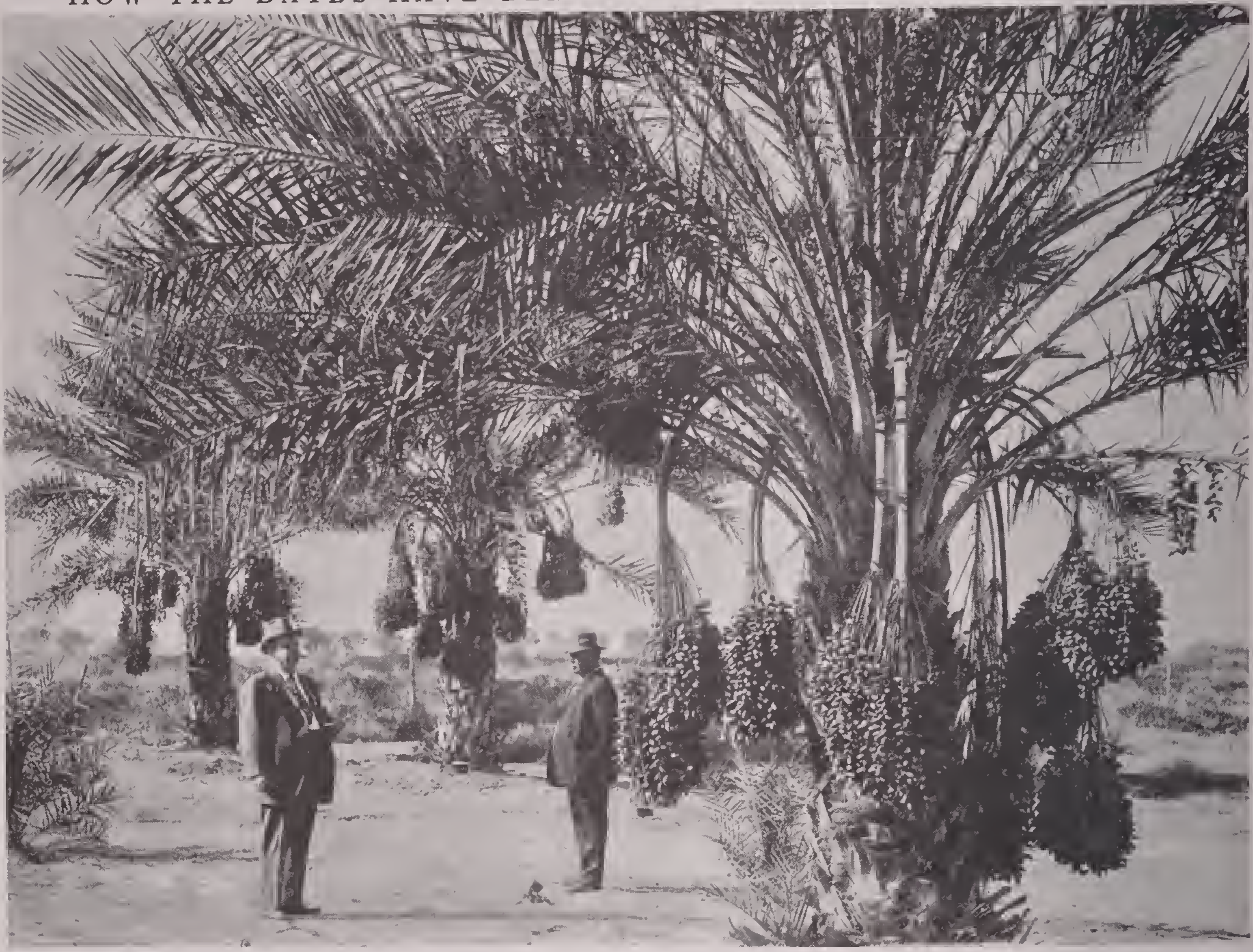
Not only is this tree remarkable in its power to resist heat and drought, but it can also withstand greater quantities of alkali in the soil than any other useful plant. This fact is of great importance to the United States, for it has made possible the introduction of the date palm into the Salton Basin (Colorado Desert) in southeastern California, where the soil is too alkaline to support any ordinary crop. Here and in southern Arizona the date has been grown with much success, the local conditions, now that irrigation has been introduced, being perhaps even more favorable for date growing than is that of the Sahara. Other countries where the date is successfully cultivated are China, Italy, Spain, and France.

The date palm attains a height of almost 100 feet. It has a straight rough trunk which bears its large cluster of leaves and fruit at the top. The leaves are feather-shaped, 12 to 18 feet long, and from 12 to 20 leaves are produced each year. These remain alive and green for several years, but finally lose their color and bend downward toward the trunk, where they are retained in very arid regions. In other regions the leaves finally break off, leaving the trunk rough.

The date palm blooms in early spring, producing from 6 to 20 flower clusters. The staminate (male) and the pistillate (female) flowers are borne on separate trees. In cultivation the pistillate flowers are usually pollinated artificially by placing a staminate spray in each pistillate tree.

Each pistillate flower cluster produces a bunch of dates weighing from 10 to 40 pounds, and a vigorous tree is allowed to produce from 8 to 12 such bunches. The tree is grown usually from shoots and begins to bear within four to eight years. It continues to bear

HOW THE DATES HAVE BEEN TRAINED TO COME TO DINNER



The wild date is an unfriendly fruit, often remaining hidden among the leaves of the palm. But its tame brothers, through centuries of cultivation, have learned to grow in such heavy clusters that they come right down as though inviting you to dine upon them.

until a century or more old, producing from 60 to 600 pounds of delicious fruit a year. Dates are of very high food value, and are eaten either fresh or dried. The trunk and leaves of the tree furnish the natives with materials for the making of houses and many necessary objects.

Scientific name, *Phoenix dactylifera*. Trunk rough, straight, unbranched, 60 to 100 feet high. Leaves pinnate, 12 to 18 feet long.

DAVID. The man who has been called "the greatest hero of Israel" began life as a shepherd boy and ended as king (about 1000 B.C.). While tending his sheep he learned to do two things so well that he was later able to be of great service to his king and country. With his harp he soothed King Saul when he was ill, and with his slingshot he killed the Philistine giant Goliath, who for 40 days had dared the Israelites to send forth a champion to fight against him. After his triumph David became King Saul's armor-bearer, and David and the king's son Jonathan were as brothers. Saul grew jealous of David's popularity with the people, and tried to kill him; but David escaped to the cave of Adullam and gathered about him a band of men who attacked enemy tribes, but not Saul's army or their countrymen. Twice David spared the life of Saul; then, in fear of his own life, he left Judah and entered the service of the Philistine king of Gath. When news was brought to David of the tragic death of Saul and Jonathan, in the battle of Gilboa, he grieved greatly, saying, "I am distressed for thee, my brother Jonathan; very pleasant hast thou been unto me: thy love to me was wonderful, passing the love of women."

David was made king of Judah, following Saul's death, and later of united Israel. He freed the land from the Philistines, and conquered the Canaanite tribes about Jerusalem and made that city his capital. He became the most powerful king between the Nile and the Euphrates; but his last years were troubled by the revolt and death of his son Absalom.

David was a brave warrior, beloved by his men, and a wise king. He is said to have written the Psalms which are given in the Bible. He made the plans for the beautiful temple which his son Solomon was to build. Thus he was not merely a warrior and statesman, but also a poet, musician, and architect as well.

DAVIS, JEFFERSON (1808–1889). The frontier state of Kentucky, strangely enough, in the short space of seven months saw the birth of Abraham Lincoln, the war-time president of the United States, and Jefferson Davis, the first and only president of the Confederate States of America. While the boys were still young, both families left Kentucky, the Davis family going to the slave state of Mississippi, the Lincoln family to the free state of Indiana and later to Illinois. While Lincoln was splitting rails in the frontier wilderness and studying borrowed books at night by the light of the open fire, Davis—who was a few months the elder—was getting a good education in the academies of Mississippi and Kentucky, and later at Transylvania University, Lexington, Ky. Before he had finished his course at Transylvania University, he secured an appointment to the military academy at West Point, from which he was graduated in 1828. He then learned something of frontier life, as a young officer at the little military post of Prairie du Chien, Wis. During the Black Hawk War Davis was ordered to Dixon, Ill., to muster into service some volunteers. The captain of the volunteers was Abraham Lincoln, and Lieutenant Davis, of the regular army, administered to him his first oath of allegiance to the United States.

JEFFERSON DAVIS

In 1835, Davis, tiring of army life, resigned his commission, and returned to his old home in Mississippi. There he became a plantation owner and acquired considerable wealth before he entered upon his political career, in 1845, as a Democratic member of Congress. When he made his first speech in that body the venerable John Quincy Adams is said to have exclaimed, "That young man will yet make his mark in American history." At the outbreak of the Mexican War next year, Davis resigned his seat to become a colonel of Mississippi volunteers. He served with distinction under his father-in-law, Gen. Zachary Taylor, being severely wounded in the battle of Buena Vista.

As soon as he returned to civil life Colonel Davis was sent by Mississippi to the United States Senate, where he succeeded to the position of leader held by the aged Calhoun. With Calhoun he opposed the Compromise of 1850. He resigned his seat in 1851 to become an unsuccessful candidate for the governorship of his state; while upholding the right of secession as a last resort he held that circumstances did not yet justify it. In 1853 he became Secretary of War under Franklin Pierce as president, and as such improved the nation's military equipment and enlarged the army which was later to be used so effectively against the seceding states.

At the expiration of Pierce's term, he returned to the United States Senate, where he continued to serve until his state left the Union. In the campaign of 1860 it was his insistence that the Democrats adopt a pro-slavery platform that split the party and permitted the election of Lincoln, the Republican candidate. In the Senate he now upheld not only the right but the necessity of secession, and when Mississippi left the Union he bade farewell to his associates in a speech of exceptional power and left Washington.

Characteristics as President of the Confederacy

Davis hoped to become the commander of the Confederate forces in the field, but instead (February 1861) he was elected president of the newly formed Confederacy. To him was given the difficult task of guiding the new government during the terrible war which followed secession. His people had no army, no navy, and limited resources. He must provide all three. For a time it seemed that he would succeed, and that the Confederacy would become one of the family of nations. His people were united in thought and feeling, and at first Davis' administration was highly popular. But as time brought military reverses, criticism began. Now Davis, who in the United States Senate had stood for the rights of the states, learned by experience that a war could not be successfully waged if each state were going to do as it pleased. Consequently he began to take more and more power into his own hands, until even his own officials at Richmond complained that there was more personal freedom under Lincoln's government.

President Davis was not indifferent to the personal liberty of his people, nor forgetful of their rights as individuals, but he was dictatorial in manner. His experience, both as an officer in the army and as a slaveholder, had developed in him self-confidence and habits of command which made it almost difficult for him to conciliate those with whom he differed. On the whole, however, he made few blunders and in the midst of hostile criticism he continued to work with zeal and energy for the Southern cause.

But finally as the blockade of the coasts of the South threw the people more and more on their own resources, and as these resources grew less and less, the struggle became hopeless. Still Davis was unwilling to give up. In his last message, dated March 13, 1865, he declared that in spite of reverses, success might yet be secured. In less than 30 days after this General Lee surrendered at Appomattox Court House; and in a short time the fugitive President Davis was captured by United States troops near Irwinsville, Ga.

For a time Davis was confined at Fortress Monroe, and his sufferings there aroused the sympathy of the Southern people. Even those who had found fault with him now regarded him as a martyr to their cause; he who had been an autocrat became an emblem of the "Lost Cause," which was still sacred to them. After two years' imprisonment, he was released on bail, Horace Greeley and other prominent Northern men becoming his bondsmen. As soon as he regained his liberty he journeyed to Canada and Europe in a vain attempt to regain his shattered health. Upon his return to the United States he tried to retrieve his broken fortunes. But the business ventures upon which he embarked proved failures, and in 1878 he retired from active life. The rest of his days were spent upon his book 'The Rise and Fall of the Confederate Government'. He died in New Orleans, in 1889, but his body was later removed to the old Confederate capital, Richmond, Va. A monument now stands in Richmond to the memory of "Jefferson Davis, the first and only President of the Confederate States of America"; and another to his daughter "Winnie Davis, the Daughter of the Confederacy."

DAVY, SIR HUMPHRY (1778–1829). As a boy in Penzance, Cornwall, Davy gave little promise of his future gifts as one of England's greatest scientists. His tastes were for making verse translations of the classics and for story-telling, rather than for science. It was not until his father died in 1794 that he set to work along the lines that brought him fame. As assistant to a surgeon apothecary, he read widely in metaphysics, ethics, mathematics, and then passed on to chemistry. All this work was done before he was 19, in preparation for the study of medicine. But his

"THE MINER'S FRIEND" TESTING HIS LAMP

Although he was famous for many discoveries, Sir Humphry Davy is best remembered for his invention of the safety lamp, which cut down tremendously the number of deadly explosions in mines.

work in research soon made him too valuable a man for any medical career. Thomas Beddoes, a prominent scientist, made him superintendent of his laboratory for the investigation of the properties of various gases; and in this laboratory he discovered the properties of laughing-gas (nitrous oxide) and experimented with its anesthetic effect.

Davy published various articles concerning his discoveries with oxygen and nitrous oxide, and became so well known to scientific men that he was engaged as assistant lecturer in chemistry and director of the laboratory at the new Royal Institution in 1801. Only ten weeks later he became professor there—all this before he was 23. With the aid of a powerful galvanic battery he worked at separating chemical elements, and also investigated the chemistry of tanning and of various phases of agriculture. Electricity took up a great deal of his attention, and so well did he work that in 1808, though France was then at war with England, Napoleon bestowed on him the medal for the best experiment of the year in galvanism. In 1812 he was knighted, and in 1820 he was made president of the Royal Society of England. His lectures drew great crowds. Some went because of the profound knowledge that Davy possessed; some because he was famous; some because he possessed a remarkable gift of explaining difficult theories in clear vivid language. Coleridge, the poet, declared that he went "in order to increase his stock of metaphors."

Davy's name will always be associated with the safety lamp that he invented. Miners in those days were often killed by explosions of mine gases, set off by the flames of their lamps. Davy discovered that if the flame was screened from contact with the outside air by wire gauze, not enough heat would be transmitted through the meshes of the screen to set the surrounding gases afire. This principle is still applied in the safety lamps of today.

Sir Humphry Davy was a truly powerful man. Cuvier, the great French scientist, said of him that "he held first rank among the chemists of this or any other age." Not only did he know how to track down knowledge, but he also had the imagination to use it and to make it clear to others. When asked what he considered his greatest discovery, Davy replied, "Michael Faraday." The latter became Davy's assistant and rose to be the most prominent physicist in England. He spent a great deal of time in the field of magnetism and made discoveries which later led to the invention of wireless telegraphy.

DAY. Whence came our familiar English names for the days of the week? *Sunday* gets its name from the sun, which in older times was worshiped as the source of life, as well as warmth and heat. *Monday* is the "moon's day." *Tuesday* is the day of the old Teutonic god Tiw or Tyr, the god of war and son of Woden (Odin). *Wednesday* is "Woden's day," chief god of the early Teutons and ruler of earth and heaven. *Thursday* is named in honor of mighty Thor, god of thunder. *Friday* bears the name of Frigg or Friia, the goddess of love and wife of Woden. *Saturday* is named in honor of Saturn, the old Roman god of agriculture, who reigned in the Golden Age.

How long is a day? The answer depends on what kind of a day you mean. The time required for the earth to make one rotation, as measured from one noon to another (passage of the sun over the meridian line) is called the "solar" or sun day. It constantly changes in length owing to the shifting of the earth's position as it revolves around the sun. Only four times a year is the actual solar day exactly the same length as our "mean" or average solar day of 24 hours. A "sidereal" or star day is the interval between two consecutive appearances of a fixed star on the meridian; it is about four minutes shorter than the mean solar day.

"Days of grace," usually three, represent an extension of time beyond the term stipulated, as for the payment of a promissory note. In many of the United States days of grace are now abolished. (*See* Calendar.)

DAYLIGHT SAVING. One hundred million dollars a year—five per cent of the total coal bill of the United States! That, statisticians tell us, represents the amount saved in 1918 by the simple expedient of moving all the clocks ahead one hour the last Sunday in March and going to bed and getting up an hour earlier until the last Sunday in October. An hour of sunlight in the morning was substituted for an hour of artificial light in the evening, and workers had the benefit of an extra hour for outdoor recreation.

The majority of city dwellers were delighted with the plan, which was made effective by Federal enactment, but the farmers made determined objection. Since farm work usually begins at sunrise, they argued it was impossible for them to gain anything by moving the clock ahead; but, on the other hand, they lost an hour at the other end of the day, since their help insisted on quitting work at the same time as city dwellers. In response to the farmers' complaints the daylight saving law was repealed in 1919 over the president's veto. In many communities, however, the practice was continued by local legislation, and in places where the standard time was not changed a considerable proportion of employers adopted earlier working hours for the summer months.

Daylight saving was adopted by most of the European nations, and by Australia, parts of Canada, and Newfoundland during the World War of 1914–18, and is still practiced in many of them. The movement was begun in England in 1907 by William Willett, but the idea originated with Benjamin Franklin more than a century before. Not only did he teach in his *Poor Richard's Almanac* that—

> Early to bed and early to rise
> Makes a man healthy, wealthy, and wise.

but when he was serving as American minister to France in 1784 he wrote an article in which he pointed out that the people of Paris could, by changing their clocks, save millions of dollars a year in candles.

DAYTON, OHIO. The abundant water-power furnished by the Mad River, which here joins the Great Miami River, has been a leading factor in making Dayton one of Ohio's busiest manufacturing cities. The best known of its industries is the huge cash register factory which covers the space of ten or twelve city blocks and sends its marvelous machines all over the world. Other important manufactures are railway cars, agricultural implements, airplanes (for this was the home of the famous Wright brothers, who first demonstrated to the world the practicability of these wonderful machines), carriages, wagons, automobiles, sewing machines, computing scales, boilers, and clothing.

But besides its up-to-date factories, Dayton has other claims to fame. After a wonderful municipal house-cleaning, during which it turned ugly vacant lots into gardens, and tore down its shacks, the city became known for its clean alleys, broad streets, many parks and gardens, and the excellence of its local government under the city-manager plan, winning the name of "Spotless Town." After a disastrous flood in 1913 which caused 84 deaths and a property loss of $128,000,000, the city immediately put in a dry reservoir system at enormous cost, which protects the entire Miami valley from the recurrence of any such disaster.

Dayton is the sixth largest city of Ohio. It lies in the heart of the fertile Miami valley which produces great crops of corn, wheat, and tobacco, and rich pasturage for live stock. Natural gas obtained from the West Virginia fields is largely used for domestic and heating purposes. The city is one of the largest which has adopted the city-manager form of government. Dayton was settled in 1796; incorporated as a town in 1805 and chartered as a city in 1841. Population. about 155,000.

DEAF, EDUCATION OF. The hardships suffered by the deaf and dumb in former times seem almost unbelievable to us today, who recognize deafness as a handicap, it is true, but a handicap that can be overcome by education to such an extent that it does not seriously interfere with a useful and happy life. Deaf-mutes can be taught "lip reading" so as readily to understand what is being said; and even without this can understand and make themselves understood by means of the finger-alphabet, and so are to be found in almost every conceivable occupation.

But in ancient times and during the Middle Ages those unable to hear, and consequently not able to speak or communicate with others except by gestures, were classed with the idiotic and insane, and were often supposed to be "possessed of a devil." It was not until the 15th and 16th centuries that a few men began to realize that in intelligence deaf mutes were normal, and that it was possible to teach them by special methods. These few early teachers used signs, pantomime, and finger spelling. But it was not until the middle of the 18th century that the duty of providing for the education of the deaf was recognized and the work put on an organized systematic basis. The first permanent school was established in America at Hartford, Conn., in 1817.

Gallaudet College at Washington was established in 1864 and named in honor of Thomas Hopkins Gallaudet, the founder of deaf-mute education in America. It is the only institution in the world devoted to the higher education of the deaf. Among its graduates are doctors, lawyers, architects, electrical engineers, chemists, publishers, editors, successful business men, and men of science.

The deaf may be taught by the sole use of writing, by gestural signs, or by finger spelling. These were the old methods, and for a long time this was all that was attempted by educators. But today in every civilized country in the world some attention is given to the additional problem of teaching the deaf—even those who have been deaf since birth—to read the lips of speakers by sight, and to speak themselves. Many schools teach exclusively by the speech method, without any use of the sign language or finger spelling. The mutes are taught to speak by watching the lips of the teacher and imitating the motions. The pupil also touches the teacher's throat when certain sounds are made so that they can be better imitated.

A. Melville Bell, of Edinburgh, Scotland, invented the Bell system of teaching articulation by "visible speech." It consists of a series of alphabetical characters, suggesting to the eye the mechanical process by which the vocal apparatus makes the sounds. This system was introduced into this country in 1872 by his son, Alexander Graham Bell, the inventor of the telephone.

DEATH VALLEY, CALIF. So barren and parched is this white desert strip of southern California, near the Arizona border, that it does indeed seem as though the hand of death had touched it. Eighteen of a party of 30 choking wornout emigrants, toiling to reach the newly discovered golden sands of California, perished in the cruel valley in 1849 and gave the name to the place. It lies between the short ranges of the Panamint and Funeral mountains, a burning waste about 150 miles long and 10 to 35 miles wide, 250 feet or more below sea level, shrouded in a deposit of white salt, chiefly borax, washed down from the mountains. This borax, together with the rich ores of the surrounding mountains, is the only output of the region. Most of the time the sun, beating down on a little cactus and greasewood and an ocean of sand, raises the temperature to 120 degrees, sometimes even to 137 degrees, and licks up all the moisture like a tongue of fire. At times the Amargosa River pours down its channel in torrents from Nevada, but usually the river bed is a dry ditch. A few jackrabbits, rats, mice, rattlesnakes, and horned toads scuttle about, crows and buzzards circle through the burning air, and a few lonely miners and Indians occasionally tread its sands. But there is indeed more death than life in Death Valley.

DECA'TUR, STEPHEN (1779–1820). "The most daring act of the age," said Lord Nelson, the famous British admiral, of Lieutenant Decatur's exploit in Tripoli harbor, on the night of Feb. 16, 1804. Pirates from the Barbary States had captured the United States frigate *Philadelphia* and taken it into Tripoli harbor, and Stephen Decatur, with a small ship and a small crew, slipped into the harbor, fired the *Philadelphia,* and escaped under the fire of 114 guns without the loss of a man. This deed made Decatur a captain in the United States Navy.

These pirates from the shores of Morocco, Algeria, Tunis, and Tripoli, had for centuries been the terror of the Mediterranean, preying on Christian commerce and capturing Christians as slaves. It was Decatur who gave them their first lesson in law, one which was completed in 1815, when he returned with an American fleet and forced them to respect the American flag.

Almost from the day he was born, at Sinnepuxent, Md., Decatur had been acquainted with the sea, for his father also was a sailor. He became a midshipman at 19, a lieutenant at 20, and his men were proud to call him captain at 25. In the War of 1812 he captured the British frigate *Macedonian* after a desperate fight. Later in the war he was surrounded by four English frigates and after being twice wounded himself and losing one-fourth of his men was compelled to surrender his ship.

At the height of his popularity Commodore Decatur, as he had then become, was killed in a duel with Commodore James Barron. He has well been called "the most conspicuous figure in the naval history of the United States for the 100 years between Paul Jones and Farragut." His best remembered saying is the toast which he once gave: "My country—may she ever be right, but right or wrong, my country"!

DECEMBER. When the old Roman calendar began with March, December was indeed the *tenth* month, as its name indicates (from the Latin *decem,* "ten"), but Julius Caesar made it the twelfth when he changed the time for the beginning of the year. It is preëminently the winter month, for in it comes the winter solstice, December 21 or 22 (*see* Equinox and Solstice).

LEARNING DECIMALS *by the Mile*

DECIMALS. Every boy knows that an automobile has a speedometer on its dashboard which looks like Fig. 1. The dial at the top indicates the speed, the left-hand dial registers season mileage, and the right-hand one indicates trip mileage. As the car travels, the rotating wheels of the speedometer cause figures to appear on the lower dials to indicate the distance traveled. There are ten figures or digits on each wheel, thus:

0, 1, 2, 3, 4, 5, 6, 7, 8, 9.

When the trip mileage dial reads as in Fig. 1, the automobile has traveled more than 75 miles. What does the right-hand figure, 8 in this case, signify?

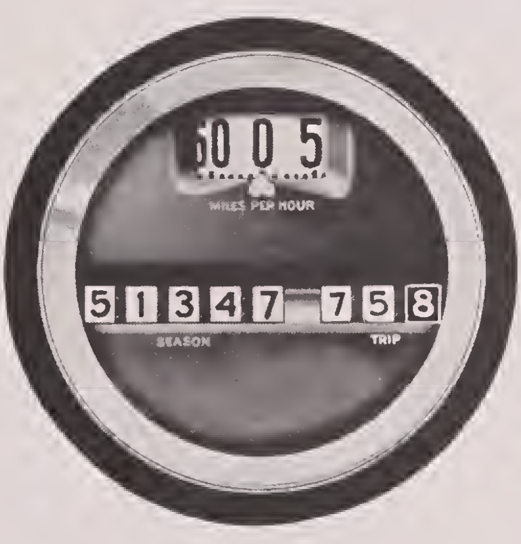


Fig. 1

If we observe closely as we ride, we shall notice that ten changes occur in the right-hand figure for every mile traveled, thus: 75.0, 75.1, 75.2, 75.3, 75.4, etc., to the end of the mile. Each change in the reading, therefore, indicates one-tenth of a mile. 75.9 means $75\frac{9}{10}$, 76.0 means 76 even, 76.1 means $76\frac{1}{10}$. In other words, we have here an illustration of the *decimal system* of writing fractions, which uses a period called the *decimal point* to separate the fraction from the whole number. The only denominations used in this system are *tenths, hundredths, thousandths,* and other powers of one-tenth. The denominator of the fraction is indicated by the position of the decimal point. Thus .1, .2, .3, etc., are always read "one-tenth," "two-tenths," "three-tenths," etc.

The convenience of this system will appear in the fact that adding, subtracting, multiplying, and dividing fractions may be performed as with whole numbers, provided the decimal point is properly handled. Since the only denominations used are tenths, hundredths, etc., fractions with other denominators must be reduced to these denominations by methods to be illustrated later.

Let us see how decimal calculations are made.

ADDITION—

1. What is the distance from Waukesha, Wis., to Oconomowoc if it is 10.8 miles to Delafield, 4.4 miles from that place to Summit Corners, and 3.0 miles farther still to Oconomowoc? From Fig. 2 you can see at a glance that to solve the problem we must add the three numbers.

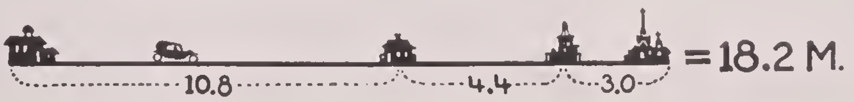


Fig. 2

Solution:

$$\begin{array}{r} 10.8 \\ 4.4 \\ 3.0 \\ \hline 18.2 \end{array}$$

Answer: The distance is 18.2 miles.

Since 10.8 = 108 tenths, 4.4 = 44 tenths, and 3.0 = 30 tenths, it is plain that the sum is 182 tenths, or 18.2, and that such numbers may be added like whole numbers, if the decimal point is properly placed.

2. On the Boston and Maine Railroad it is 3.4 miles from Boston to Cambridge, 6.5 miles farther to Waltham, 3.3 miles more to Kendal Green, 3.5 miles from Kendal Green to Lincoln, while Concord is 3.4 miles beyond Lincoln. How far is Concord from Boston? (Fig. 3.)

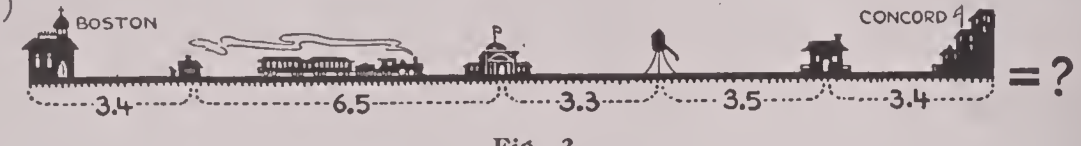


Fig. 3

Solution: 3.4
6.5
3.3
3.5
3.4
20.1 *Answer:* Concord is 20.1 miles from Boston.

3. A boy taking a bicycle trip in the suburbs of Chicago rides west from Evanston 7.8 miles, then turns north on Milwaukee Avenue .3 miles, and then rides westward 2.4 miles to the end of Ballard Road, and .6 miles beyond to a bridge over the Desplaines River. How far does he ride? (*See* Fig. 4.)

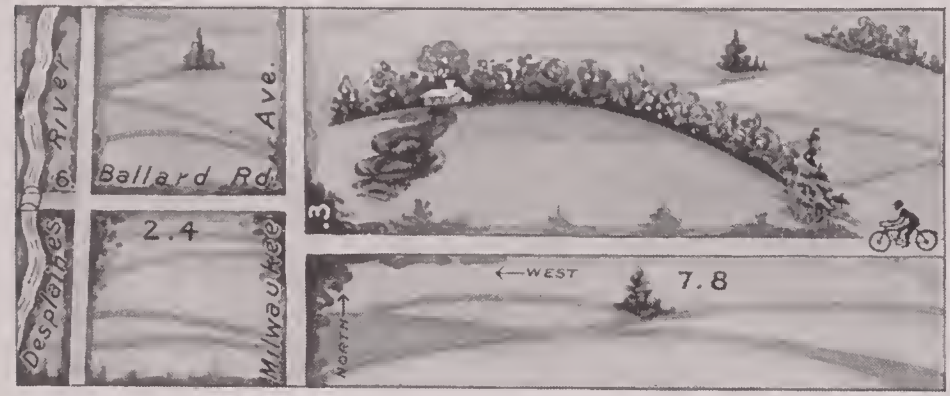


Fig. 4

Solution: 7.8
.3
2.4
.6
11.1 *Answer:* He rides 11.1 miles.

4. The speedometer shows the distance from Glencoe, Ill., to Wheeling to be 7.8 miles, Wheeling to Buffalo Grove 4.0 miles, Buffalo Grove to Long Grove 2.5 miles. How far is it from Glencoe to Long Grove? See if you can find the answer.

SUBTRACTION—

1. The speedometer shows the distance from Milwaukee to Brookfield to be 13.1 miles, and at Waukesha it registers 16.8 miles. How far is Waukesha from Brookfield?

Solution: 16.8
13.1
3.7 *Answer:* The distance is 3.7 miles.

2. West Bend is 33.7 miles from Milwaukee, Kewaskum 45.4 miles. How far from West Bend to Kewaskum?

Solution: 45.4
33.7
11.7 *Answer:* The distance is 11.7 miles.

3. A car leaves Boston with the dial set at 00.0. At Fitchburg it registers 49.6, at Gardner 64.7, and at Hoosac Tunnel, 135.0. How far is it from Fitchburg to Gardner? Gardner to Hoosac Tunnel? Fitchburg to Hoosac Tunnel?

Solutions:	64.7	135.0	135.0
	49.6	64.7	49.6
	15.1	70.3	85.4

MULTIPLICATION—

1. A motorcycle runs 9 times around a track .8 of a mile in circumference. What is the total distance that it travels? *See* sketch below (Fig. 5).

Solution: .8
9
7.2 *Answer:* It travels 7.2 miles.

Since .8 = 8 tenths, the product is 72 tenths or 7.2.

2. A taxicab travels from Buffalo to Tonawanda and back three times (6 times 10.4 miles). How far has it traveled?

Solution: 10.4
6
62.4 *Answer:* It traveled 62.4 miles altogether.

DIVISION (*Measure* or *Comparison*)—

1. The round trip from M— to R— and back is 4.8 miles. How many round trips make 24 miles?

Solution: 5
4.8) 24.0
24.0

Proof: 5×4.8 = 24.0. In other words, 48 tenths are contained in 240 tenths 5 times.

2. Smith's automobile can run only 9.5 miles on one gallon of gasoline. He proposes to run from Concord, N. H., to Boston by a route which he knows to be 76 miles long. How many gallons of gasoline will he use?

Solution: 8
9.5) 76.0
76.0 *Answer:* He will use 8 gallons.

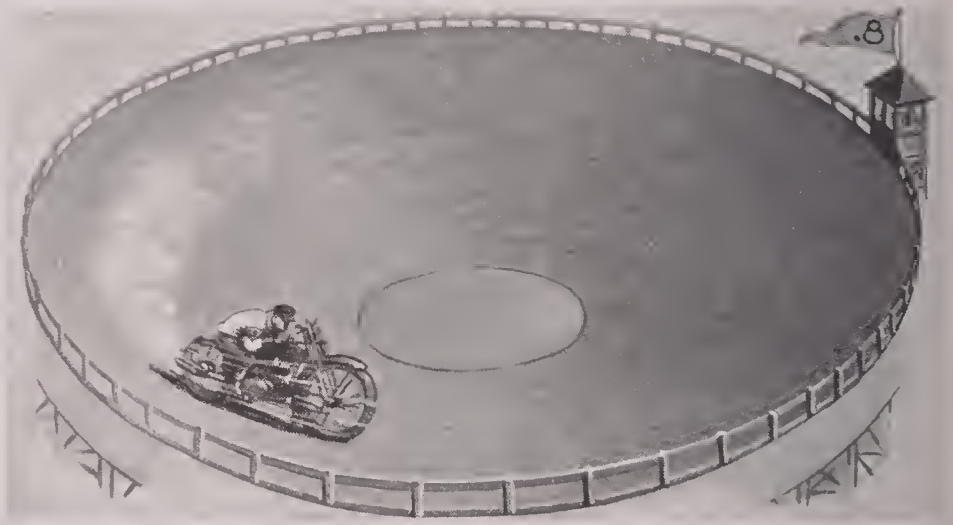


Fig. 5

DIVISION (*Partition*)—

1. It is 55.2 miles from Washington to Harper's Ferry. What is $\frac{1}{3}$ of this distance?

Solution: 18.4
3) 55.2 *Proof:* 3 × 18.4 = 55.2.

2. Find $\frac{1}{5}$ of 48.

Solution: 9.6
5) 48.0 *Proof:* 5 × 9.6 = 48.

3. A farmer proposes to divide an 18-acre field into 4 equal fields. How many acres would each smaller field contain? Fig. 6 shows you the answer. If he should divide the 18-acre field into *five* equal fields, how much would each contain? Can you work it out?

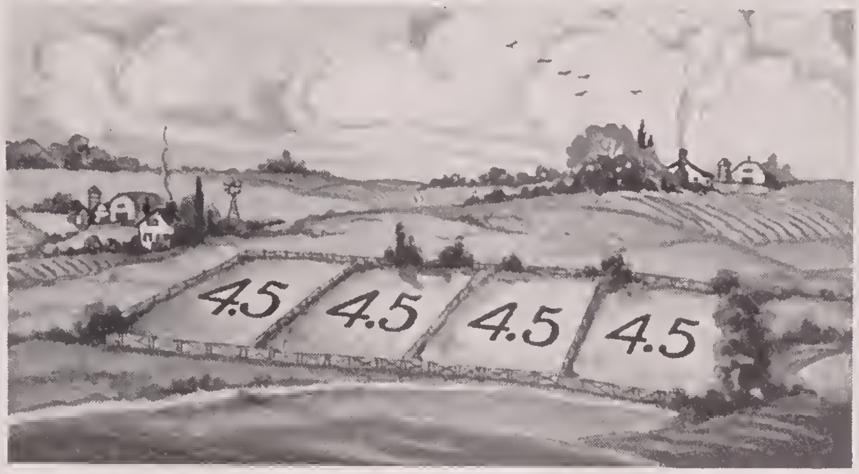


Fig. 6

Problems Involving Hundredths

So far, the only fractions we have used are tenths. Now let us go a step farther and see how hundredths are handled.

(a) One dollar = 100 cents; therefore one cent = $\frac{1}{100}$ of a dollar.

(b) One dime = $\frac{1}{10}$ of one dollar.

(c) One cent = $\frac{1}{10}$ of one dime = $\frac{1}{10}$ of $\frac{1}{10}$ of one dollar = $\frac{1}{100}$ of one dollar.

(d) (Read just as you read "c.") One cent = .1 of one dime = .1 of .1 of one dollar = .01 of one dollar (written $.01).

(e) $.17 is 17 hundredths of one dollar; $.39 is 39 hundredths of one dollar.

(f) $7.25 may be read 7 and 25 hundredths dollars. Read the following in the same way: $4.33; $2.15; $.34; $.20.

ADDITION—

How far is Poughkeepsie from New York if it is 14.49 miles to Yonkers, 10.03 miles farther to Tarrytown, and 48.24 miles from Tarrytown to Poughkeepsie?

Solution: 14.49
10.03
48.24
72.76 *Answer:* The distance is 72.76 miles.

An important point to bear in mind when *adding* or *subtracting* decimals is that the numbers must be written so that the decimal points fall in a column. This brings units under units, tenths under tenths, hundredths under hundredths, etc.

SUBTRACTION—

The distance from New York to Yonkers is 14.49 miles; from New York to Albany, 142.20 miles. How far is it from Yonkers to Albany?

Solution: 142.20
14.49
127.71 *Answer:* The distance is 127.71 miles.

MULTIPLICATION—

Find the frontage (length of front line) of 8 lots lying in a row, if each is 25.44 feet wide.

Solution: 25.44
8
203.52 *Answer:* The total frontage is 203.52 feet.

DIVISION—

Poughkeepsie is 72.76 miles from New York. If I want to walk the distance in four days, how far must I travel each day, on the average?

Solution: 18.19
4.) 72.76 *Answer:* $\frac{1}{4}$ × 72.76 (read "$\frac{1}{4}$ of 72.76") = 18.19.

Decimal Quotients

Examples:

1. 6 = what part of 8?

Sometimes we find what part one number is of another by division, thus:

.75
8) 6.00 *Answer:* 6 = .75 × 8. (Six equals 75 hundredths of 8.) In such a case the sign × should be read "*of*," not "*times*," or "*multiplied by*."

Verification: Draw a line 8 in. long. Divide it into parts 2 in. long; 2 in. = $\frac{1}{4}$ of 8 in.; 6 in. = $\frac{3}{4}$ of 8 in.; but $\frac{3}{4}$ of 1 = $\frac{3}{4}$ of 1.00 = .75; so 6 = .75 of 8.

2. A two-foot rule folds in 6-inch lengths. What decimal part of the whole 24 inches is 1 length or 6 inches? (*See* Fig. 7.)

.25
Solution: 24) 6.00
4 8
1 20
1 20

Answer: 6 = .25 × 24 (read the sign × as "of").
Proof: This answer is evidently right, as 6 = $\frac{1}{4}$×24 and .25 = $\frac{25}{100}$ = $\frac{1}{4}$.

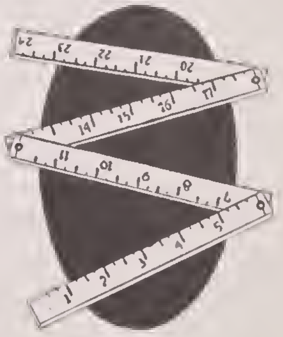


Fig. 7

Principle. To find what decimal part one integer is of another, divide the number regarded as a part by the one regarded as the standard or whole. Annex zeros to the dividend, set them off by a decimal point, divide as in whole numbers. Point off as many figures in the quotient as there were zeros annexed to the dividend. Sometimes the quotient must be carried out more than two decimal places, as illustrated below.

Example: 7 ft. = what part of 56 ft.?

Solution: .125
56) 7.000
5 6
1 40
1 12
280
280 *Answer:* 7 = .125×56 (7 = 125 thousandths of 56).

Sometimes the division will not come out even, no matter how far the quotient is carried, as illustrated below.

1. 8 miles = what part of 24 miles?

Solution: .333+
24) 8.000
7 2
80
72
80
72 Here we may write as answer: 8 = .333+ of 24, or 8 = .33$\frac{1}{3}$ × 24.

2. 3 miles is what part of 21 miles?

Solution:

```
          .1428 +
  21 ) 3.0000
       2 1
        90
        84
         60
         42
         180
         168
          12
```

Answer: 3 = .1428+ of 21 (3 = 1428 ten-thousandths of 21).

In this case the answer is not exact. We call it approximate. As many decimal places as desired can be used. For ordinary purposes two or three will suffice. The plus sign indicates that the answer is only approximate.

Decimal Multipliers

1. Find .5 of 92. This means $\frac{5}{10}$ of 92 or $\frac{1}{2}$ of 92.

Solution:

```
  92
  .5
46.0
```

Answer: .5 × 92 = 46 (read "five-tenths *of* 92 = 46").

Proof: When 46 is divided by 92, the quotient is .5.

```
        .5
  92) 46.0
```

Or .1 of 92 = $\frac{1}{10}$ of 92 = 9.2.
.5 of 92 = 5 × 9.2 = 46.0.

2. Find .5 of 16 ft.

Solution:

```
 16
 .5
8.0
```

Answer: .5 of 16 ft. = 8 ft.

3. Find .3 of 16; .7 of 16; .9 of 16.

4. Find .25 of 24.

Solution:

```
  24
 .25
1 20
4 8
6.00
```

Answer: .25 of 24 = 6.00 = 6.

5. Find .37 of $250.

Solution:

```
  $250
   .37
 17 50
 75 0
$92.50
```

Answer: .37 of $250 = $92.50.

Multiplying by a decimal fraction should be conceived as finding a fraction of the multiplicand.

Decimal Multipliers and Decimal Multiplicands

(a) $\frac{1}{10} \times \frac{1}{10} = \frac{1}{100}$ (read the sign × as "*of*," not "*times*").

(b) $\frac{3}{10} \times \frac{2}{10} = \frac{6}{100}$.

(c) .3 × .2 = .06.

From these examples we get the principle that any number of tenths multiplied by any number of tenths = some number of hundredths.

(a) $\frac{1}{10} \times \frac{1}{100} = \frac{1}{1000}$ (read $\frac{1}{10}$ of $\frac{1}{100}$).

(b) .1 × .01 = .001.

(c) .01 × .1 = .001.

Thus we see that any number of tenths multiplied by any number of hundredths = some number of thousandths.

Principle. Place the decimal point in any decimal product so as to set off as many figures to the right of it as there are to the right of the decimal point in the multiplier plus the number in the multiplicand.

Example: How many inches in 3.2 meters? (1 meter = 39.37 inches.)

Solution:

```
  39.37
    3.2
  7 874
118 11
125.984
```

Answer: 3.2 meters = 125.984 inches.

Multiply as if there were no decimal points, then place the point between the 5 and the 9 of the product. There are two figures to the right of the point in the multiplicand and one in the multiplier, so there must be three to the right in the product.

Decimal Quotients and Decimal Divisors

Example: 3.6 is what part of 7.2?

Solution:

```
          .5
  7.2 ) 3.60
        3 60
```

Answer: 3.6 is .5 × 7.2 (.5 of 7.2).

Add a zero to the dividend and divide exactly as in whole numbers. There should be one place in the quotient, because if 7.2 were multiplied by the quotient .5, the product would be 3.60, a number with two decimal figures to the right of the point. Hence the multiplier must have had one decimal place since the multiplicand 7.2 had but one. A convenient method in dividing by decimals is to move the decimal point to the right in the divisor to make it a whole number. Move the decimal point in the dividend the same number of places to the right, adding zeros if necessary.

Finding the Number of Which a Given Number is a Given Part

1. 9 = .5 of what number?

Solution:

```
      1 8
  .5) 9.0
```

Answer: 9 is .5 of 18.

Proof:

```
 18
 .5
9.0
```

.5 of 18 = 9.0.

2. 9 = .75 of what number?

Solution:

```
          12
  .75 ) 9.00
```

Answer: 12 is the number.

3. 8.5 = .17 of what number?

Solution:

```
          50
  .17 ) 8.50
```

Answer: 8.5 is .17 of 50.

Principle. When dividend and divisor have the same number of decimal places (to the right of the point), the quotient is a whole number.

Decimal Equivalents for Fractions

It is convenient to know the following decimal equivalents for the fractions used most commonly:

$\frac{1}{2}$ = .5	$\frac{3}{5}$ = .6	$\frac{7}{8}$ = .875	$\frac{1}{9}$ = .11$\frac{1}{9}$
$\frac{1}{4}$ = .25	$\frac{4}{5}$ = .8	$\frac{1}{3}$ = .33$\frac{1}{3}$	$\frac{1}{11}$ = .9$\frac{1}{11}$
$\frac{3}{4}$ = .75	$\frac{1}{8}$ = .125	$\frac{2}{3}$ = .66$\frac{2}{3}$	$\frac{1}{12}$ = .08$\frac{1}{3}$
$\frac{1}{5}$ = .2	$\frac{3}{8}$ = .375	$\frac{1}{6}$ = .16$\frac{2}{3}$	$\frac{1}{20}$ = .05
$\frac{2}{5}$ = .4	$\frac{5}{8}$ = .625	$\frac{5}{6}$ = .83$\frac{1}{3}$	$\frac{1}{25}$ = .04

To reduce a *common fraction* to a *decimal*, annex as many zeros to the numerator as necessary, and divide by the denominator. Thus: $\frac{3}{16}$ = 3.000 ÷ 16, or .1875. To reduce a *decimal* to a *common fraction*, write the decimal with its denominator and reduce it to its lowest terms. Thus: .12 = $\frac{12}{100}$ or $\frac{3}{25}$.

Decimals as we know them were not used until the latter part of the 16th century, after Simon Stevinus (1548–1620) a mathematician, physicist, and engineer of Brugas, had devised and published a system. The "decimal point" is said to have been invented by Bartholomaeus Pitiscus in 1612 and was used by Napier in his logarithms. Since then the use of decimals has grown continuously.

When LIBERTY *was* FIRST PROCLAIMED

How the Demand for American Independence Rose to a Great Cry—How Jefferson Put that Cry into Immortal Words—And How Roaring Cannon and Racing Horsemen Carried Afar the Message of the Liberty Bell

DECLARATION OF INDEPENDENCE. "Yesterday the greatest question was decided which ever was debated in America, and a greater, perhaps, never was nor will be decided among men." Thus John Adams wrote to his wife concerning the Declaration of Independence, the principle of which was accepted by the Continental Congress on July 2, 1776. Adams and others had long desired that this step should be taken, but most of the colonists were loath to sever the tie that bound them to the mother country. They wished merely to manage their own affairs in their own way, and if they were allowed to do this they preferred to remain a part of the British Empire, subject to the British king.

BOSTON RECEIVES THE TIDINGS OF LIBERTY

The news of the Declaration of Independence aroused great enthusiasm everywhere. Here we see the excited crowd listening while it is being read from the steps of the Old State House in Boston.

Even the battles of Concord and Lexington and Bunker Hill had not changed this attitude. In June 1775 Washington promised to use every exertion to restore "peace and harmony between the mother country and the colonies"; and as late as September Jefferson "looked with fondness towards a reconciliation." It was not until early in 1776 that Washington raised the Continental flag and began to advocate independence. Late in 1775, however, when the news arrived that the king had issued a proclamation warning other countries against trading with the "rebels," and that he was obtaining troops from his German neighbors with which to crush the rebellion, many of the colonists did begin to recognize that reconciliation was impossible and that independence had become inevitable.

The movement towards independence was aided by the appearance, in January 1776, of a pamphlet entitled 'Common Sense', by Thomas Paine. Thousands of copies were sold, and soon the colonists were ready to follow its suggestion that "a government of our own is our natural right." Early in May some of the delegates in Congress were instructed by the colonies they represented to vote for independence. Virginia went further than this and told her delegates to propose the step.

Accordingly, on June 7, 1776, Richard Henry Lee offered his resolution that "these United Colonies are, and of right ought to be, Free and Independent States." As some of the colonies had not instructed their delegates what action to take, nothing was done at the time except to appoint a committee to draw up a declaration in case it should be needed. On this committee were John Adams, Benjamin Franklin, Robert Livingston, Roger Sherman, and Thomas Jefferson. Owing to Richard Henry Lee's absence from Congress because of sickness in his family, the task of preparing the historic document, which was to announce the colonists' position to the world, was committed to Thomas Jefferson.

Lee's resolution was accepted by Congress on July 2. Then came the debate on the document which Jefferson meanwhile had drawn up. After two days of discussion, led by John Adams, "the Colossus of that debate," the Declaration was accepted with little change. The New York delegates, having failed to receive instructions, could not vote then, but gave their approval on July 9. The "signing" of the Declaration did not take place on the 4th, but at various times after that date.

Jefferson's Great Interpretation of the People's Will

Jefferson had put nothing new into the Declaration; he had merely written out a statement of the ideas of government that the American people held. It is because the Declaration of Independence expresses so well the beliefs of the American people that its short nervous sentences have lived in the memories of men. Today the engrossed copy of the Declaration of Independence, faded and almost illegible, is kept in the state department at Washington carefully locked in a steel case, so that light and air may not destroy the precious parchment.

THE HEART OF THE DECLARATION OF INDEPENDENCE

> *"WE HOLD these truths to be self-evident, that all men are created equal; that they are endowed by their Creator with certain unalienable rights; that among these are life, liberty, and the pursuit of happiness. That to secure these rights, governments are instituted among men, deriving their just powers from the consent of the governed; that, whenever any form of government becomes destructive of these ends, it is the right of the people to alter or to abolish it, and to institute a new government, laying its foundation on such principles, and organizing its powers in such form, as to them shall seem most likely to effect their safety and happiness. . . .*
>
> *"We, therefore, . . . do solemnly publish and declare, That these United Colonies are, and of right ought to be, Free and Independent States; that they are absolved from all allegiance to the British crown, and that all political connection between them and the State of Great Britain is, and ought to be, totally dissolved; and that as free and independent States, they have full power to levy war, conclude peace, contract alliances, establish commerce and do all other acts and things which independent States may of right do. And for the support of this declaration, with a firm reliance on the protection of Divine Providence, we mutually pledge to each other our lives, our fortunes, and our sacred honor."*

These are the passages from the immortal Declaration which for over a century have caused men's hearts to beat faster whenever they are read.

According to report, when the Declaration was accepted on July 4, the Liberty Bell, hanging in the belfry of the old Pennsylvania State House, now known as Independence Hall, first proclaimed the news to the people of Philadelphia. The firing of cannon and racing horsemen carried the tidings far and wide, even to the most distant colonies. The bell had been cast in Philadelphia in 1753, and by prophetic order of the Province this inscription was placed on it: "Proclaim liberty throughout all the land unto all the inhabitants thereof." On July 8, 1776, this bell again fulfilled its purpose by summoning the inhabitants of the city to listen to the reading of the Declaration. Each year thereafter it brought together the people to celebrate the anniversary of the Declaration of Independence, until 1835, when it cracked while tolling for the funeral of John Marshall, the celebrated Chief Justice of the Supreme Court.

The sight of this historic old bell has stirred the hearts of millions at the World's Fairs of 1893, 1904, and 1915. But because of a new crack which threatens to break the bell into two pieces, it has since remained in the hallway of the old State House of Philadelphia, an object of veneration. It was lightly struck by officers of the city on April 6, 1917, when the United States entered the war with Germany.

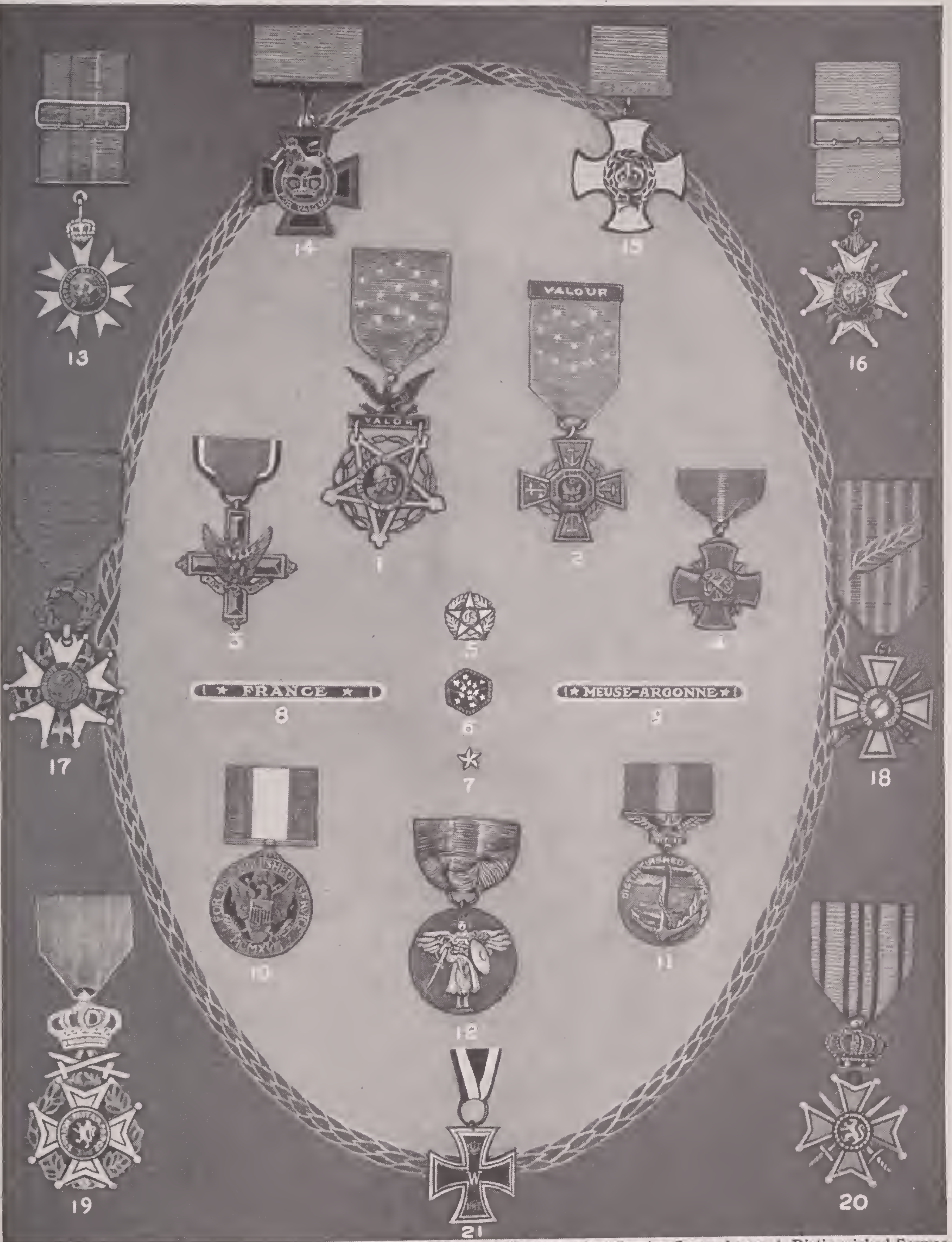
DECORATIONS OF HONOR. Today all great nations reward special valor and patriotic service with decorations of honor, which are often more highly prized than titles of nobility. The wearing of the British Victoria Cross, the officer's cross of the French Legion of Honor, or the United States Medal of Honor is indisputable evidence of a rare degree of heroism.

The much-prized Medal of Honor, sometimes called the Congressional Medal, was established in 1861 by vote of Congress and is presented by the president in the name of Congress. It may be given to any officer or enlisted man of the army, but only for an act of extreme heroism on the field of battle, performed (in the words of the law) "at the risk of his life" and "above and beyond the call of duty." The Navy Medal of Honor, which formerly could be awarded for any great heroic acts, even those performed in times of peace, was placed in 1919 on the same footing as the Army medal.

Until the World War these medals were the only decorations of honor issued by the United States. In 1918, however, two other decorations were established by the president and confirmed by Congress. The first of these, the Distinguished Service Cross, is awarded for distinguished acts of bravery which do not warrant the Medal of Honor. It is not restricted to enlisted men and officers, but may be won by any person, man or woman, serving with the army "in connection with military operations against an armed enemy." The Navy Cross corresponds to the Distinguished Service Cross, except that the heroism displayed need not be in connnection with actual naval operations against an enemy. The other new decoration is the Distinguished Service Medal, awarded for service of exceptional merit "in a position of great responsibility." It is designed to reward the soldiers and civilians behind the lines and at home, whose work is essential to the success of the fighting men, but who do not necessarily take part in actual military operations. The Navy Distinguished Service Medal was established for a similar purpose.

The same decoration is never awarded twice to one person, but for each succeeding act which deserves the award a suitable device is worn on the ribbon of the

MEDALS THAT MARK MEN OF VALOR



American—1. Medal of Honor, Army; 2. Medal of Honor, Navy; 3. Distinguished Service Cross, Army; 4. Distinguished Service Cross, Navy; 5. Lapel button indicating service in the World War (of silver instead of bronze for wounded men); 6. Rosette indicating possession of Medal of Honor; 7. Silver star indicating citation for bravery; 8. Overseas service clasp of Victory Medal; 9. Battle clasp for Victory Medal; 10. Distinguished Service Medal, Army; 11. Distinguished Service Medal, Navy; 12. Victory Medal. *British*—13. Order of St. Michael and St. George; 14. Victoria Cross; 15. Distinguished Service Order; 16. Knight Commander of the Bath. *French*—17. Legion of Honor; 18. Croix de Guerre. *Belgian*—19. Order of Leopold; 20. Croix de Guerre. *German*—21. Iron Cross.

first medal or cross. In the case of the army decorations, for instance, a bronze cluster of oak leaves indicates a second award of the same decoration.

In addition to the above mentioned decorations of honor, the United States has issued Service Medals to all officers and enlisted men who have served honorably in its various wars and campaigns, as follows:

Army Service Medals—Civil War, Indian Campaigns, Spanish Campaigns, Spanish War (non-fighting service), Cuban Occupation, Porto Rican Occupation, Philippine Campaigns, Philippine Congressional (McKinley Medal), China Campaign, Cuban Pacification, Mexican Campaign, Mexican Border, and Victory Medal (World War).

Navy and Marine Corps Medals—Civil War, Spanish-American War, Philippine Campaign, West Indies, Manila Bay (Dewey Medal), Cuban Pacification, China Relief Expedition, Nicaraguan Campaign, Haitian Campaign, and Mexican Campaign.

Other navy awards are the Meritorious Service Medal to crews of vessels which rendered particularly distinguished service during the Spanish War, the Good Conduct Medal for sailors and marines, and the Expeditionary Ribbon for the numerous expeditions of the Marine Corps, for which no campaign medal exists, such as the Panama, Korea, and Abyssinia expeditions.

MAKING THE BADGE OF A HERO

The coin-like piece of metal is being placed over the mold below. A heavy steel plunger will then descend upon it and the product will be a "Croix de Guerre."

Decorations, service medals, and the like are worn only on occasions of ceremony. At other times the medals are represented by some device such as a rosette or ribbon which indicates the particular award the wearer has received. The Medal of Honor, for instance, is represented by a blue rosette with 13 white stars upon it. In general, it is the official custom to wear a strip of ribbon of the same pattern as the one from which the medal is suspended. These are called "service ribbons."

The Famous Victory Medal

The Victory Medal was awarded to all officers, enlisted men, field clerks, and nurses who served in the army, the navy, or the marine corps between April 6, 1917 (when war was declared against Germany), and Nov. 11, 1918 (the date of the armistice), as well as to those who served in the later campaigns in Russia and Siberia. The "rainbow" ribbon of this medal is the same for all the allied countries, but the medal designs differ.

Battle clasps to be worn on the ribbon of the Victory Medal were awarded to all those who took part in any one of the following battles: Cambrai, Somme defensive, Lys, Aisne, Montdidier-Noyon, Champagne-Marne, Aisne-Marne, Somme offensive, Oise-Aisne, Ypres-Lys, St. Mihiel, Meuse-Argonne, and Vittorio-Veneto (Italy). In each case the name of the battle appears upon the clasp. Those who served in the front lines, but did not take part in any of the battles named, are entitled to wear a clasp marked "Defensive Sector"; and those who saw service abroad, but not in the front lines, are entitled to a clasp naming the country where they were stationed. The navy has similar clasps indicating the nature of service performed, such as Patrol, Submarine, Mine-Laying, etc.

If an officer or enlisted man was cited for bravery in general orders during the war, but did not receive a decoration for such bravery, he is entitled to wear for each such citation a silver star on the ribbon of his Victory Medal. When the Victory service ribbon alone is worn, a small silver star indicates a citation, while a bronze star indicates a battle.

Finally, for civilian wear, Victory Buttons are permitted to all those who possess a Victory Medal, while other service medals may be represented by miniature service ribbons.

The highest honor which the British fighting man can win is the Victoria Cross, established by Queen Victoria in 1856. It may be awarded to men of all ranks in the army and navy (with the exception of the native ranks of the Indian army), but only for some signal act of conspicuous bravery in the presence of the enemy. So high is the standard set for the "V.C.," as it is called, that during the first 50 years of its existence less than 600 were issued, although Great Britain fought numerous important campaigns, including the Boer War.

The Distinguished Service Order (D.S.O.) is given to army and navy officers for conspicuous merit in time of war, including not only heroism under fire, but also other important services in the field. It was founded in 1886 and illustrates a type of distinction unknown in the United States, but quite common in European and other countries, in which the receiver of the award becomes a member of an honorary *order* or society. Some of these orders actually date back to the old orders of knighthood, founded in the Middle Ages; others, like the D.S.O., are of recent origin and have merely a formal significance. The Distinguished Conduct Medal, given to non-commissioned officers and men in the ranks, corresponds to the D.S.O. of the commissioned officers.

The following British decorations were created during the World War: the Military Cross, for commissioned officers of captain's rank or below; the Military

Medal, for non-commissioned officers and civilians for acts of bravery in the field; the Distinguished Service Cross and the Distinguished Service Medal, both of them naval decorations corresponding to the new army awards.

Membership in the French Legion of Honor, one of the most famous of all distinctions, is awarded for meritorious service to France in military and civil life. A scientist may receive the decoration for some valuable discovery as well as a soldier for an act of conspicuous bravery. The order was originally founded by Napoleon in 1802, and now includes the following ranks: Grand Master (the President of the Republic), Grand Cross (20), Grand Officers (50), commanders (250), officers (2,000), and chevaliers (12,000 maximum). Membership in the order may be conferred upon foreigners as well as Frenchmen, and upon women as well as men. The French Croix de Guerre, established during the World War, and the Medaille Militaire, founded by Napoleon III, are the two most noted decorations for purely military services.

Germany's highest military decoration was the Order for Merit (Ordre pour le Merite), dating back to 1667. The different grades of the Iron Cross, founded in 1813, formerly marked very high military distinction, but in the World War this decoration was so freely bestowed as to lose most of its value.

The chief Italian decoration is the Medal of Honor, and in Belgium the Order of Leopold and the Military Cross are the most highly prized.

Orders of Knighthood

None of the decorations and orders so far mentioned carry with them any special title of nobility. The Orders of Knighthood, mentioned below, do carry such titles, and confer upon the holder a rank of precedence in those countries which still maintain royal or imperial houses. Usually known as "knights," the members of these orders are addressed "Sir," unless they have some higher inherited title.

Among the most important of these British orders are the following: The Order of the Garter, established by Edward III about 1348, and consisting chiefly of members of the royal family. Its motto is *Honi soit qui mal y pense* ("Evil be to him who evil thinks"); membership is indicated by the letters "K.G." after the name. The Order of the Thistle is an ancient Scottish order dating from 1540; initials, "K.T." The Order of St. Patrick, for Ireland, was created in 1783; initials, "K.P." The Order of the Bath, founded in 1399, consists of three classes—Knights of the Grand Cross (G.C.B.), Knights Commanders (K.C.B.), and Companions (C.B.). The Order of St. Michael and St. George was created in 1818 and is divided into the same classes (G.C.M.G., K.C.M.G., and C.M.G.). Other British orders are the Order of the Star of India (G.C.S.I., etc.); the Order of the Indian Empire (G.C.I.E., etc.); the Victorian Order (G.C.V.O., etc.), the Order of the British Empire, and the Order of Merit.

Outside the British Empire the chief orders of knighthood are the Order of the Golden Fleece (Spain and Austria); the Order of the Annunziata (Italy); the Order of the Black Eagle and the Order of the Red Eagle (Prussia); the Order of the Chrysanthemum and the Order of the Eastern Sun (Japan); the Order of Christ (Papacy). The Golden Rose, consecrated by the pope on the fourth Sunday of Lent and sent as a mark of special favor to some distinguished individual, church, or civil community, is a papal honor of the highest rank but different in character.

DEER. Like cattle and antelopes, deer are hoofed and cud-chewing animals; but unlike cattle and antelopes, they have solid horns or "antlers," which are usually grown only by the males, and are shed and renewed once every year from the frontal bone of the head. It takes from ten weeks to four months for the antlers to attain full size. The renewal takes place during the spring and summer while the mother deer are rearing their young. The growing antlers are richly supplied with blood vessels and covered with a soft hairy skin called "the velvet." When the antlers are full-grown a ring is formed at their base which pinches off the blood vessels. The velvet then shrivels up and comes off in strips, or the animal may brush it off by rubbing against tree-trunks or bushes. Female caribou and their relatives the reindeer carry antlers, but the females of other deer do not, except occasionally in a rudimentary form.

THE "PERFUME BEARER" OF INDIA

The little Musk Deer—he's about 20 inches high—carries under the skin of his abdomen a gland which yields the valuable "musk" so much used in making perfumes.

The coat is renewed twice a year, in spring and autumn, at least over the body and neck. The winter coat is heavier and its hairs are coarser and longer than those of the summer coat. All deer are easily tamed. In the wild state they are timid and peaceable except during the breeding season. They feed on leaves, twigs, grass, lichens, moss, and juicy plants, and as a rule drink at sunset.

The young of the deer are spotted, and in the Virginia deer and their allies are called "fawns," while the young of moose and caribou are called "calves." The female deer is called a "hind" or "doe," while the female moose or caribou is called a "cow." Males are variously termed "stags," "bucks," or "bulls."

Writers differ greatly in regard to the number of species of deer but there are not less than 30, found

THE TIMID RUNNER OF THE WOODS

Deer are found in virtually all parts of the world except Australia, Southern Africa, and certain islands. Everywhere their beauty and grace are admired. The group above is a family of Axis Deer from India.

on all the continents and large islands, except Australia, New Zealand, Madagascar, and Southern Africa. The deer of the tropics and sub-tropics are usually inferior in size and beauty to those of temperate regions. One exception is the axis or spotted deer of India and Ceylon. Among the more important groups are the red deer, the reindeer (called caribou in America), the wapiti (miscalled "elk"), the true elk (known as the moose in America), the Virginia deer, Columbian black-tail deer, and the mule deer.

"WATCHFUL AS A STAG"

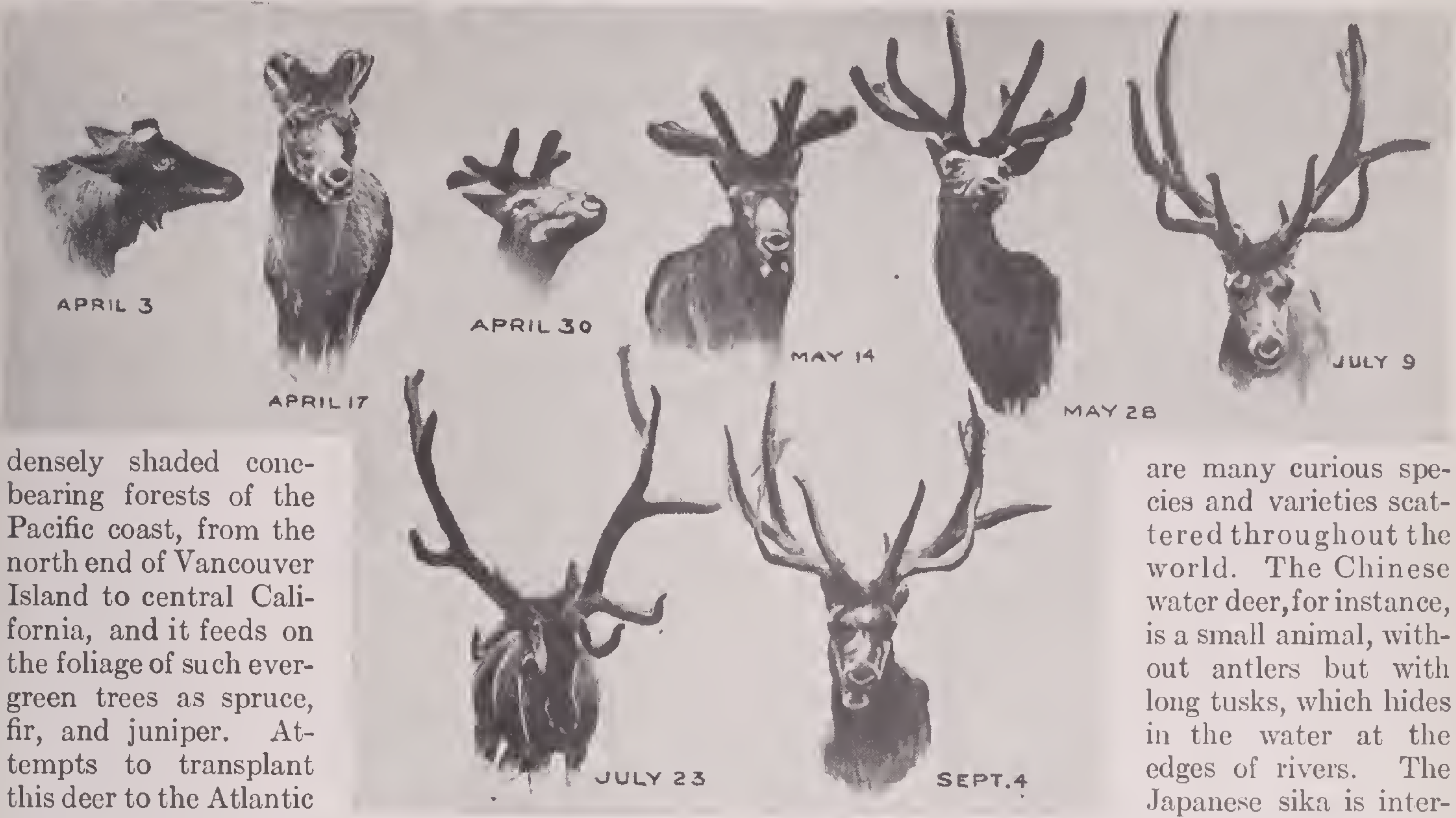
The male deer, called "stags," are the guardians of the family, whose duty it is to warn of approaching danger. This Mule Deer stag has perhaps heard the crack of a twig under the photographer's foot.

The red deer, found only in Europe, is the most abundant. It is commonly called the "stag" and often so named in song and story, although the term stag is also used to denote the male of any species of deer. The red deer is about four feet high at the shoulder and seven feet long. The antlers project upward and outward, and a full-grown buck presents a fine appearance during the autumn and winter months. Their senses of sight, smell, and hearing are very acute, and they are timid and fleet.

The Virginia or white-tailed deer has the widest range of any deer in any part of the world. It was formerly found everywhere in the United States except in Delaware, Oregon, Nevada, and California. In northern United States, where it attains a larger size than in the Great Plains region, it is known by a different specific name. The Virginia deer of Texas is also large. Diminutive races of this deer in Arizona and Florida are known as Arizona white-tailed deer, and Florida white-tailed deer, respectively. In Canada it is sometimes miscalled the "red deer." It is given the additional name "white-tailed," because of its bushy wedge-shaped tail, snowy-white underneath and on the edges. When the deer runs, the tail is held aloft like a waving white flag. Its antlers are cylindrical and rise a short distance from the forehead, then the beam grows forward abruptly and from it arise long sharp tines, generally three after the buck has reached maturity. Virginia deer are forest animals and protect themselves by staying persistently in the cover of brush or timber and carrying their heads low. They are graceful in body and beautiful in coloring, and in parts of their range attain a noble size, some individuals reaching a weight of more than 300 pounds.

The Columbian black-tailed deer of the Pacific coast of America is smaller than the Virginia deer. The outer surface of its tail is black and gives the creature its name. The antlers vary in shape, in some individuals forming a double Y shape, in others branching much as in the white-tailed deer, which it resembles in color. It inhabits the well-watered and

HOW THE STAG GROWS HIS ANTLERS EVERY YEAR



The picture dated April 3 shows how the stag appears in the spring, after he has lost his last year's pair of antlers. The pictures up to May 28 show the antlers in "velvet"—that is, incased in the fleshy substance which covers them until grown. The remaining pictures show the completion of growth and loss of the "velvet"—and then Mr. Deer is all dressed up with fighting antlers for a few months, until it is time to grow a new pair.

densely shaded cone-bearing forests of the Pacific coast, from the north end of Vancouver Island to central California, and it feeds on the foliage of such evergreen trees as spruce, fir, and juniper. Attempts to transplant this deer to the Atlantic coast have failed. The Sitka deer is a smaller variety of the Columbian black-tailed deer.

The mule deer is a handsome animal, larger than the Virginia deer. It is easily recognized by its very large ears, the peculiar double branching of its large antlers, its short white tail tipped with black, and the white patch on the rump. In winter its color is steel gray, in summer grayish brown. Its home is among the picturesque "badlands" and foothills of the Rocky Mountain region and the deep ravines along rivers, but it also inhabits high plateaus. It is a spirited high-headed animal, and a bold traveler. It is found most abundantly from Colorado to southern British Columbia, but survivors are also seen in parts of Mexico, and as far east as North Dakota. It has been killed faster than it could breed, so that its extermination is probable unless it receives protection. It is difficult to acclimatize this deer in the region east of the Mississippi owing to the absence there of the rarefied climate and dry food which seem essential to its well-being.

WHO GOES THERE? FRIEND OR FOE!

This White-Tailed Virginia Deer is hovering between fear and curiosity. In another second he'll be bounding away to safety.

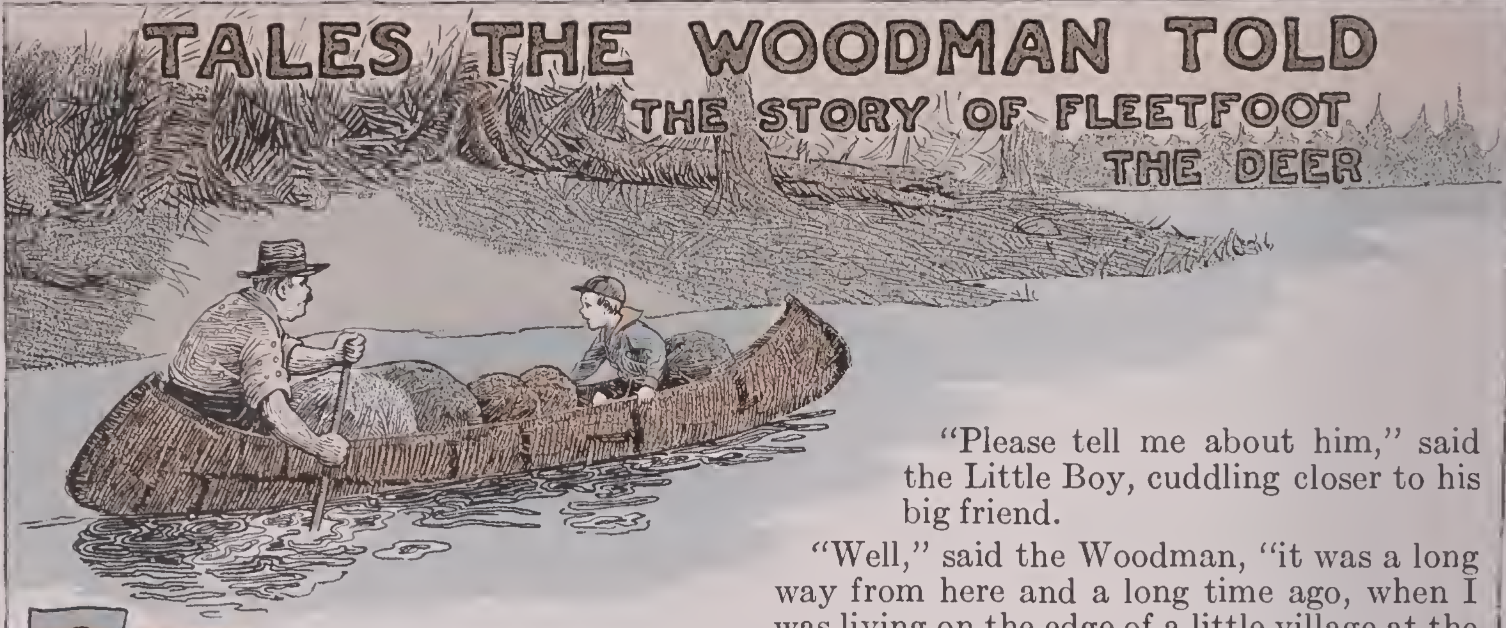
In addition to these more common groups of deer, there are many curious species and varieties scattered throughout the world. The Chinese water deer, for instance, is a small animal, without antlers but with long tusks, which hides in the water at the edges of rivers. The Japanese sika is interesting because of the patch of white hair on the rump. When the animal is quiet, these hairs lie closely bunched; but when it is alarmed, they flare out into a chrysanthemum-like bunch, which serves as a guiding mark for the herd while in flight. Several varieties of this deer are distributed over Manchuria.

The muntjac of India is almost piglike in bodily structure, with short legs and neck. These deer are awkward runners and can barely outdistance a sheep; but they show remarkable facility in crawling about through underbrush. Indian sportsmen often call them "barking deer," because their cry of alarm is a bark like that of a fox. The smallest deer is the "pudu" of the Chilean Andes; it is only 18 inches high. South America also has the numerous family of the "brockets"—deer the size of roe-bucks and smaller, with simple spike-like antlers. The "pampas deer" is abundant in Argentina, while in the Chilean and Peruvian Andes we find the "guemals."

The wapiti, moose, caribou, and reindeer are described in separate articles under those headings.

TALES THE WOODMAN TOLD

THE STORY OF FLEETFOOT THE DEER



ONCE the Little Boy's father and mother let him go with the Woodman on one of his long trips into the big forest. They went in a canoe, which the Woodman paddled up a winding river. After a long time they came to a little lake, all set about with tall trees and swamps and thickets of underbrush. The hush of evening was over the lonely water as they came to a grassy place with a sandy beach, where they were to camp.

"What was that?" asked the Little Boy, in a startled whisper, as a sudden crashing was heard in a thicket near the water's edge.

With a few strong strokes the Woodman brought the canoe to land. As they clambered out he pointed to some heart-shaped tracks on the sand and said:

"A deer; that's what you heard, I reckon."

"Really?" cried the Little Boy excitedly. "Oh, I *wish* I could have seen him! If we'd had a gun you could have shot him—*bang!* Just like that."

The Woodman smiled at this outburst. As the Little Boy helped to pitch the tent and make a fire and fry the bacon, the Woodman cheered him by telling him that he would probably have other chances to see deer before they went back home, if he looked sharp.

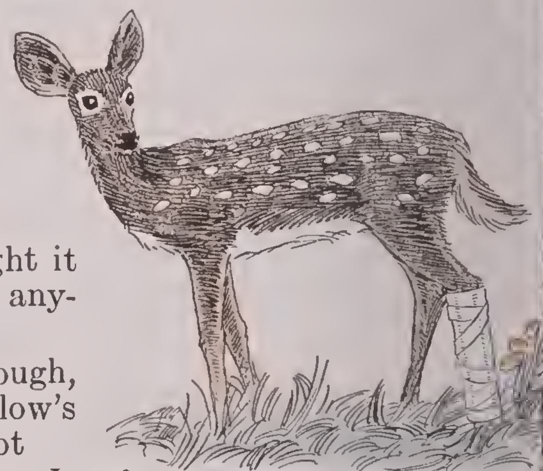
When the frying pan and tin plates were washed up, and they were sitting about the camp-fire after supper, the Woodman said:

"Did you ever see a picture of a fawn—a little baby deer? I caught one once and he was the prettiest and cutest thing you ever saw. He had a silky coat all covered with white spots about as big as five-cent pieces."

"Please tell me about him," said the Little Boy, cuddling closer to his big friend.

"Well," said the Woodman, "it was a long way from here and a long time ago, when I was living on the edge of a little village at the foot of a mountain. One day on the mountain-side I saw a mother deer with a tiny fawn only a few days old following her. From the way it limped I knew that it had hurt one of its feet. When the mother doe saw me coming she ran away. But the poor little fawn could not run, and I caught it as easy as anything.

"Sure enough, the little fellow's left hind foot had been broken—by getting caught in a crack in the rocks, or in a trap, I guess. Dogs from the village or a hungry wildcat would surely have killed him if I had let him go, so I carried him home with me.



In a few days the broken bones had begun to knit

"I put splints on his leg and kept him in a box where he could not jump about. Because he was such a young fawn I had to feed him milk from a baby's bottle. In a few days the broken bones had begun to knit together, and in a few weeks his leg was as strong as ever. I named him Fleetfoot, because he ran and capered so about the yard."

"Would he let you pet him?" asked the Little Boy, his eyes glistening in the firelight.

"I should say he would!" exclaimed the Woodman. "Why, he was the tamest thing you ever saw! He would come up to you and look at you with his big soft eyes, and lick your hands if you'd let him. But I

He would come up and lick your hands if you'd let him

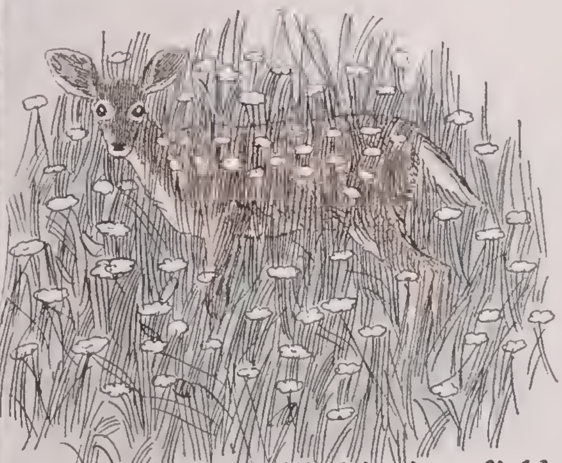
never cared for that, for it made them feel as though they were coated with glue. The way he used his ears you would think he could almost talk with them! They moved back and forth at every sound, showing pleasure, excitement, fear, and other emotions as plainly as your face does. He would stand and let you stroke his head and body as much as you wanted to. And pretty! Why, his spotted coat of reddish brown and white was as glossy as could be, and his slender legs were the most graceful you could imagine!

"You know, I never knew what those white spots on his brown coat were for until one day in July, when he was about three months old. I was playing with him in a field of daisies, when suddenly he was gone! I couldn't see him anywhere. Presently he made a movement, and there he was, among the daisies, not 20 feet away! You see, the white spots that covered his body looked so exactly like the daisy blossoms that you had to look twice to tell which was deer and which was the field.

"That's what they call 'protective coloration' in the books. The little deer is protected in this way during his first summer, while he is young and needs to lie hid from his enemies. In the autumn, when the flowers have ceased to bloom and the fields turn brown, the spots disappear. Fleetfoot's coat then became as brown as the withered grass, and it grew longer and thicker as winter approached."

"Did he drink milk from a bottle all this time?" asked the Little Boy, whose mind turned to practical details.

"We gave him some milk until along in the autumn," said the Woodman, "but he soon learned to eat grass and leaves and the tender twigs of bushes and trees. To tease him I would often hold the bottle up high so that he would have to stand on his hind legs to reach it. Sometimes he would walk after me as far as across the street in this way. When I didn't let him have the bottle right off, he would rise up and strike me sharply with his front hoofs. Lucky for me he was



I was playing with him in a field of daisies and suddenly he was gone

I would often hold the bottle up high

Fleetfoot loved the water

so little! That is one of the ways a grown deer fights. A stag can cut a dog to ribbons with his sharp hoofs.

"Fleetfoot loved the water," the Woodman continued, "and in summer nothing pleased him better than to race through the shallow river, splashing the water all over his head and body. Most of it rolled off his coat at once, and even when he lay down in the water he never got wet to the skin. Sometimes when I took him for a walk over the hills he would dash off and it would look as though we had seen the last of him. Then presently here he would come back again, with his ears laid back and his white tail in the air, and bounding over every rock and bush in his path.

"But it was most fun to see him that winter. Even when it was 20° below zero, he would cuddle down in the deep snow, chewing his cud and sleeping in comfort. At first he was lonesome, and would walk 'round and 'round the house, stopping to look in at each window and begging us to come out.

"Then a man brought a tame black-bear cub and a young prairie wolf for me to take care of for him. After they got acquainted the three played together like children. Sometimes when Fleetfoot was eating a slice of bread I had given him, the bear would stand on his hind legs and take the bread from the deer's mouth. Then Fleetfoot would rise on his hind legs and with his sharp forefeet hammer the bear on his thick head. But the bear never seemed to mind it.

"Fleetfoot liked better to play with the young wolf. For hours at a time they would play tag about the house and yard. When the wolf tagged the deer, he would pull out a tuft of the deer's hair with his teeth; when Fleetfoot tagged the wolf, he knocked Mr. Wolf over on his back with his sharp hoofs. Neither seemed to mind the rough play."

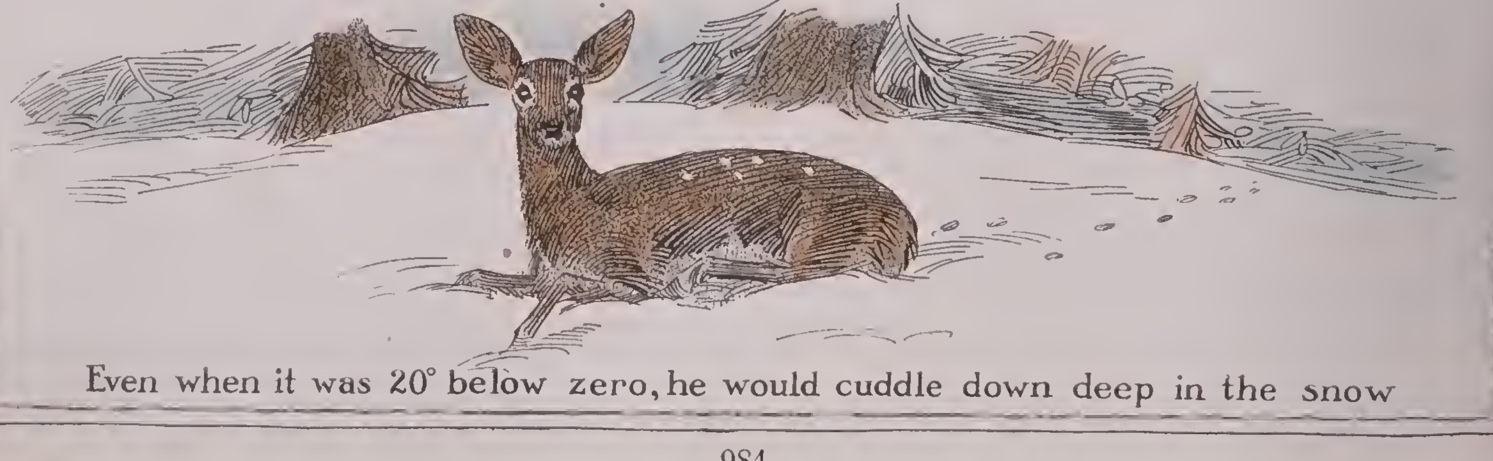
The Woodman laughed as he thought of the funny tricks of these pets. Then he added, soberly:

"When spring came I had to let Fleetfoot go. You see he was so active that he could easily jump a six-foot fence. That meant we could have no garden with him around. Anyway, he was full grown now, and was quite able to take care of himself in the forests."

The Woodman yawned, knocked the ashes from his pipe and prepared to go to bed. But the Little Boy was not satisfied.

"Didn't you *ever* see Fleetfoot after that?" he asked.

"Oh, yes!" said the Woodman. "All that spring and summer, and the next fall, I saw him occasionally in the woods or on the mountain-sides. And he remembered me, too. When I would call to him he would come



Even when it was 20° below zero, he would cuddle down deep in the snow

Johnny Bear takes Fleetfoot's bread

trotting up and eat bread or apples out of my hand. His antlers had begun to grow, but they were still covered with the soft 'velvet', and he loved to have me rub them. By October they had become hard and sharp-pointed. When I would see him then, there were usually two or three soft-eyed does waiting for him, but not daring to approach us, as he did. You see, he was full grown now and had found his own people and was one of them again. But he did not forget the friend who had been good to him when he was a tiny helpless fawn."

The Little Boy was already tucked in between the blankets of their comfortable spruce-bough bed. The Woodman was just taking off his shoes to follow his example.

"You know," he added, "before I turned Fleetfoot loose, I notched one of his ears the way we do with cattle, so that I could always know him again. After that autumn I was away from home for about five years. When I came back after such a long time you wouldn't think—"

Fleetfoot liked better to play with the young wolf

The Woodman turned to see whether the Little Boy was still awake.

"What happened?" asked the Little Boy, drowsily.

"Well, sir," said the Woodman, "I went out hunting one day, and in a runway in the forest, on the mountain-side, I saw the biggest deer, with the finest spread of antlers I ever saw in my life. He was only a hundred feet or so away, and I couldn't have missed him. But just as I was about to pull the trigger I saw something that made me lower my gun, and the deer bounded into the forest and was gone."

"What was it you saw?" asked the Little Boy, wide awake once more.

"Maybe I was mistaken," said the Woodman, blinking at the Little Boy. "But as the old fellow pricked up his ears, I thought I saw a notch in his right ear just like the mark I had given Fleetfoot. Anyway I couldn't shoot him after that."

The Woodman blew out the lantern and got heavily into bed. The last thing he heard was the Little Boy saying sleepily:

"I'm glad we haven't got any gun. I don't think I'll *ever* want to kill a deer, now."

I thought I saw a notch in his right ear

Defoe′, Daniel (1661–1731). Just as Jonathan Swift is known first of all by 'Gulliver's Travels', so Daniel Defoe, "first of journalists and prince of story-tellers," is known by his best book, 'Robinson Crusoe'. People who hardly know the name of its author can give you full accounts of Crusoe's island, of the shipwreck, the raft, and of "my man Friday."

Not very much is known of Defoe's early life except that he was the son of a London butcher, was educated to be a clergyman, and that in religion he was a Dissenter. That is, he belonged to one of the sects which made up the Puritan movement and did not believe in, or "dissented" from, the established Church of England. In 1702 he published a pamphlet called 'The Shortest Way with Dissenters'. In this he pretended to agree with the Tory or Church of England policy of persecuting the Dissenters, but he advised such ridiculously severe punishments as to discredit that policy. The Tory government ordered his arrest for writing this satire, describing him as "a middle-sized, spare man, about 40 years old, of a brown complexion and dark brown colored hair, but wears a wig; a hooked nose, a sharp chin, gray eyes, and a large mole near his mouth." He was sentenced to three days in the pillory and to an indefinite term in prison. Crowds of sympathetic friends surrounded him while he was in the pillory. While he was in prison he began the *Review*, a sort of newspaper which he kept in circulation until 1714. This was the first of several such periodicals with which Defoe was connected, and which are important as the forerunners of the newspapers of today.

DANIEL DEFOE
Author of the famous story 'Robinson Crusoe'.

Defoe was released from confinement after less than a year, through the influence of a statesman whom he later helped by writing political pamphlets. But it is not in his political writings that we are most interested. What people seek for today are the signposts which lead toward his work in fiction. Fiction as such seemed wicked to many people of that time, so Defoe wrote various "true histories." Pirates, thieves, and adventurers gave him his material. When he had nothing real to work over, his facile imagination supplied the lack—he made up the characters, the events, and the moral.

The most successful "history" that he invented was that of 'Robinson Crusoe'. To be sure, the story of Alexander Selkirk, a sailor who had been shipwrecked on a lonely island, gave him the foundation for the book. But Defoe invented all the clever touches, all the laborious effort of Crusoe's struggle against wind, weather, and lonesomeness. As someone has said, he put a commonplace Englishman on a desert island and let him live like an Englishman. The shipwrecked mariner has always been a favorite idea in world fiction. Crusoe adds to the idea the homely virtues of England—steadfastness, patience, and inventiveness in the face of difficulties.

Why do not Defoe's other stories of adventure, such as 'Captain Singleton' and 'Moll Flanders', have the power of 'Robinson Crusoe'? One reason is that they have no plot; they merely wander along from one incident to another. Defoe had a plot forced upon him in 'Robinson Crusoe'. There was a man on a desert island; he must live or die. If he had died, Defoe would have had no story, and so he shows step by step Crusoe's struggle to live. That struggle provided the thread which held together the whole series of the hero's thrilling adventures. (*See* Crusoe, Robinson.)

Defoe's chief works were: A satirical poem, 'The True-born Englishman' (1701); 'The Shortest Way with Dissenters' (1703); 'Robinson Crusoe' (1719); 'Captain Singleton' (1720); 'Moll Flanders' (1722); 'A Journal of The Plague Year' (1722); 'A Tour through the Whole Island of Great Britain' (3 vols., 1724–1726).

Dehy′drated food. Dehydration is the modern name for drying fruits and vegetables. In its cruder forms it has long been practiced, for it means simply taking the water out of foods to preserve them. Perhaps your parents can remember seeing your grandmothers spread thin layers of sliced apple, pumpkin, or berries on pans to dry in the sun. Sun drying is a slow process, but it is still practiced commercially where the climate is warm and dry, notably in California, Oregon, and Washington, for prunes, raisins, and small fruits such as blackberries; and to a limited extent in the eastern states where there are many small plants for drying apples. It is supplemented by oven drying in various forms.

In recent years the more scientific process called "dehydration" has developed into a great industry. Dehydrating plants usually consist of receiving, drying, and sweetening rooms. The fruit is taken in and washed, peeled, cored, and cut into slices or cubes. Then it is bleached with mild sulphur fumes and washed with water to take away the stains. Following this, it is taken into the drying rooms and spread upon trays where air heated to 150 or 160 degrees is forced over it by fans. Fruits or vegetables dry in this way in from 4 to 12 hours instead of the two to six weeks required for drying in the sun. After being placed in "sweetening rooms," where the natural sugary and tasteful qualities are brought back, fruits are packed in neat, paper-lined boxes. Foods dried in this way are much more wholesome and attractive than the sun-dried product.

Many devices have been perfected to improve this process. Sometimes kilns are built with furnaces below and drying rooms above, where the workers move about to keep the fruit or vegetables from burning or sticking to the pans. Again, the fruits may be placed upon trays in steam-heated cabinets. But the most elaborate device is the "dehydrating tunnel," which is a large tube of wood, steel, or concrete, with several compartments heated to varying temperatures. The food passes through these compartments on miniature trucks, and is ready for use when it reaches the other end. Every care is taken to keep the air dry. When dried by these rapid processes sliced potatoes and apples come out as white as though they had been sulphured. Peas, beans, carrots, etc., retain their natural color and are an excellent substitute for the fresh vegetables. Spinach does not crumble, while tomatoes retain their full flavor and when soaked in water cannot be distinguished in color from the fresh vegetable. Prunes dried by the modern process are a delicious contrast to the old "Turkish" prunes which gave the fruit its former bad name (*see* Prunes). Powdered and evaporated milk are also important dehydrated products (*see* Milk).

Explorers have long used dehydrated foods such as powdered milk and dehydrated fruits and vegetables because large quantities of food can be carried in this way, and keep in good condition for years.

During the World War, the United States government urged farmers and householders to dry fruits and vegetables and thus add to the food supply. Many simple devices were made for home drying, and it was found that food dries very well when placed before an ordinary electric fan. A rack made of lath with wire mesh for trays makes an effective drier when placed above a stove. Small cabinets working in a more scientific way have been provided for home use.

DE KALB, BARON JOHANN (1721–1780). Although of German parentage, Baron De Kalb was a French soldier, born in Alsace. We are chiefly interested in him because he came to America to help the revolted colonies, and here lost his life after serving creditably with the armies of Washington for three years.

De Kalb had entered the French army in 1743, and had risen rapidly to the rank of brigadier-general. In 1768 he was sent to America by the French government to investigate the possibilities of a revolt of the American colonies against England. The colonies were not ready for action at that time. When they did finally rebel, De Kalb offered his services, and with Lafayette joined the American army under Washington in 1777, with the rank of major-general. In 1780 he was sent south with some 2,000 men, and at the battle of Camden, S. C., on August 16, he was second in command to General Gates. When Gates fled from the field, De Kalb and his men sustained the attack of the whole British force, until he fell, pierced with eleven wounds. Three days later he died, a prisoner in the hands of the British. A monument to his memory was erected in Camden in 1825, his old companion in arms, Lafayette, laying the cornerstone.

The LITTLE "*Blue Hen*" STATE

Extent.— North to south, 96 miles; east to west, from 9 to 35 miles. Area, 2,370 square miles. Population (1920 census), 223,003.
Natural Features.—Flat sandy country, swampy along Delaware Bay and in the southern portion.
Products.—Corn, wheat, hay, garden produce, fruit, and dairy products; iron and steel manufactures, leather and leather goods, ships, paper, timber products, explosives and chemicals, canned and preserved fruits and vegetables.
Cities.—Wilmington (112,000 population), New Castle, Dover (capital), Milford, Lewes.

DELAWARE. The little "Blue Hen" State—as Delaware is curiously called—has for its northern boundary the arc of a circle with a 12-mile radius drawn around Newcastle as a center. Projecting down between this circle and the eastern boundary of Maryland is a tiny triangle of land, often overlooked, which belongs to the state of Pennsylvania.

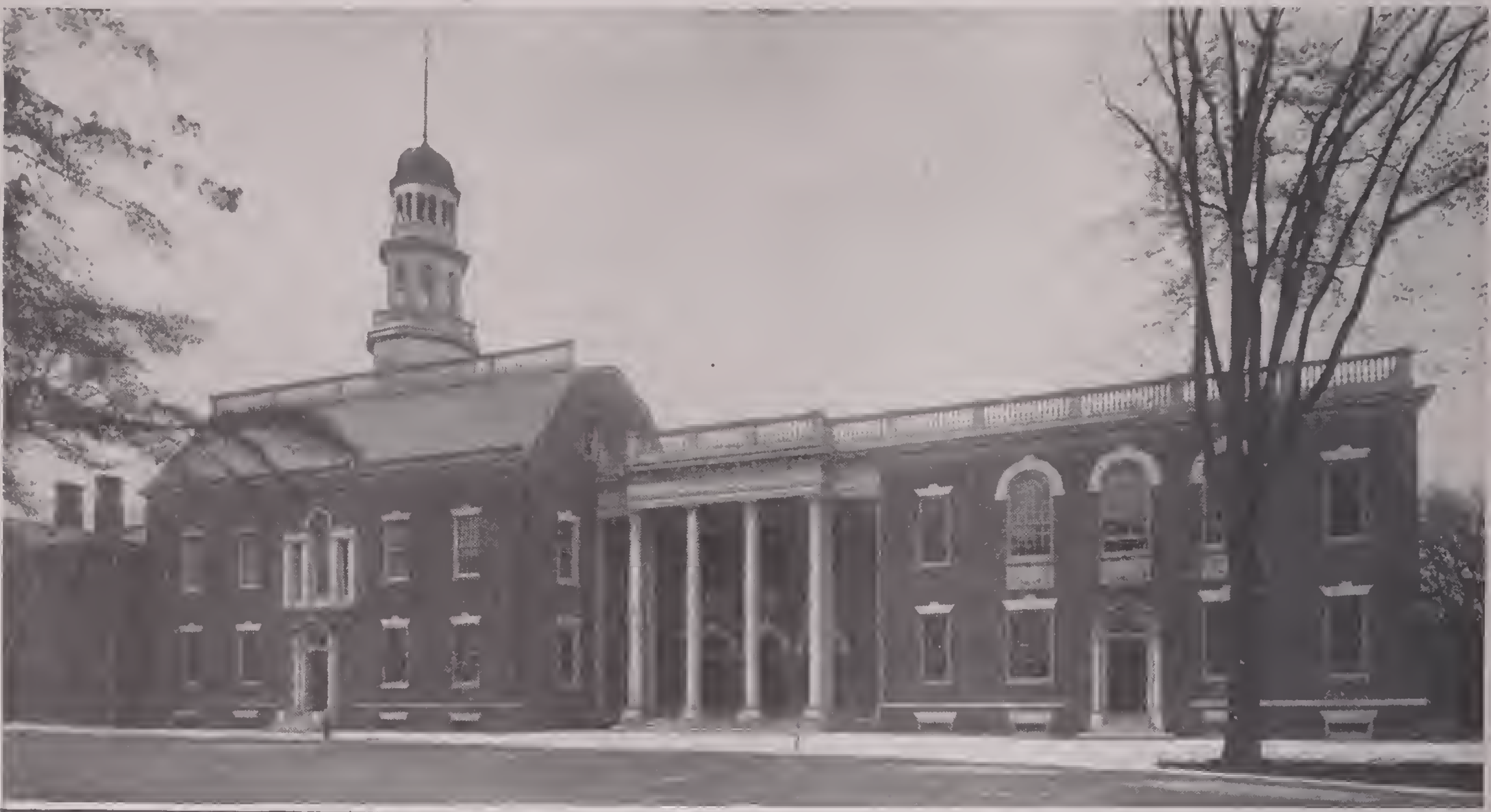
Delaware occupies about one-third of the peninsula lying between Delaware and Chesapeake Bay. Next to Rhode Island, it is the smallest state in the Union. A few of its many small streams emptying into Delaware Bay are navigable for small craft. The Brandywine River and Christiana Creek in the extreme north unite about half a mile from the Delaware River to form a spacious harbor for the city of Wilmington. The only other harbors are at New Castle, five miles south of Wilmington, and Lewes, which is guarded by a massive $2,000,000 breakwater that was 40 years in building. The Delaware and Chesapeake Canal, 13½ miles long, completed in 1829, affords water transportation between Wilmington, the Delaware River, and Chesapeake Bay.

More than half the people of the state live in Wilmington, the only city with a population of more than 100,000. New Castle, the second largest city, is the seat of great ship-building and iron and steel industries. Dover, the capital, is a beautiful little inland town.

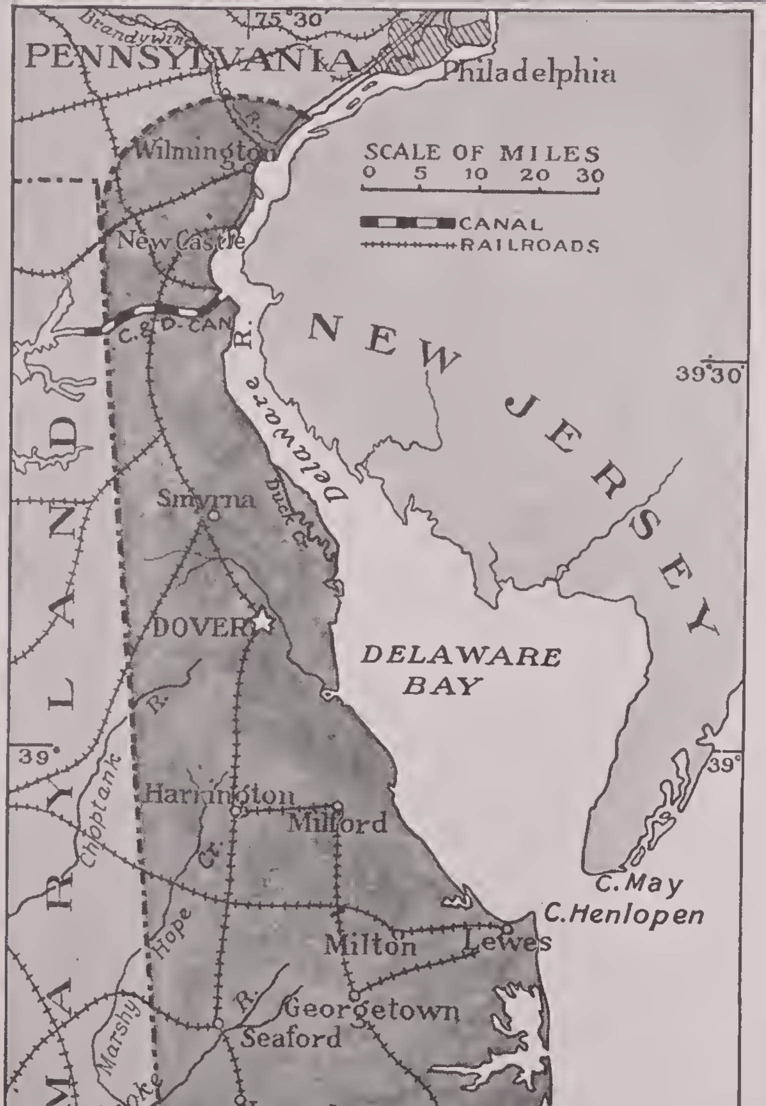
Rolling and rock-ribbed on the Brandywine to the north, flat and rich in the center, sandy and light in the south, the soils are exceptionally fertile, and agriculture is the principal occupation, although the opening of rapid transportation has deprived the state of its advantageous hold on the northern and eastern markets. No other state compares with it in the proportion of land under cultivation. The whole state is one great market garden. Corn and wheat are the largest crops; Delaware fruit has a special reputation. Apples have now passed peaches, the fruit which first brought wealth to Delaware. Peas, tomatoes, and strawberries are valuable crops.

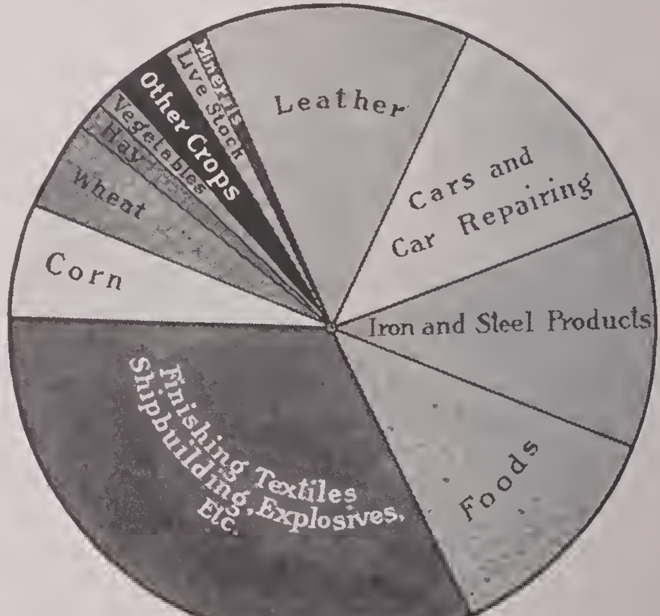
For a state with so small a population, Delaware has important manufacturing interests. These include leather goods, cars, paper and wood pulp, powder, ships, iron and steel (the foregoing chiefly in Wilmington), and canned foods and timber products. Granite, porcelain clay (kaolin), and feldspar are the chief mineral resources. The fisheries (oysters, shad, herring, etc.) are of considerable value.

THE HISTORIC STATE CAPITOL AT DOVER



Delaware's Capitol is pleasingly different from those of most states. Instead of having the usual soaring dome and classic columns which most states have copied from the National Capitol at Washington, Delaware's seat of government is reminiscent in its style of colonial days. It was built in 1722 as a court house, but has since been remodeled.



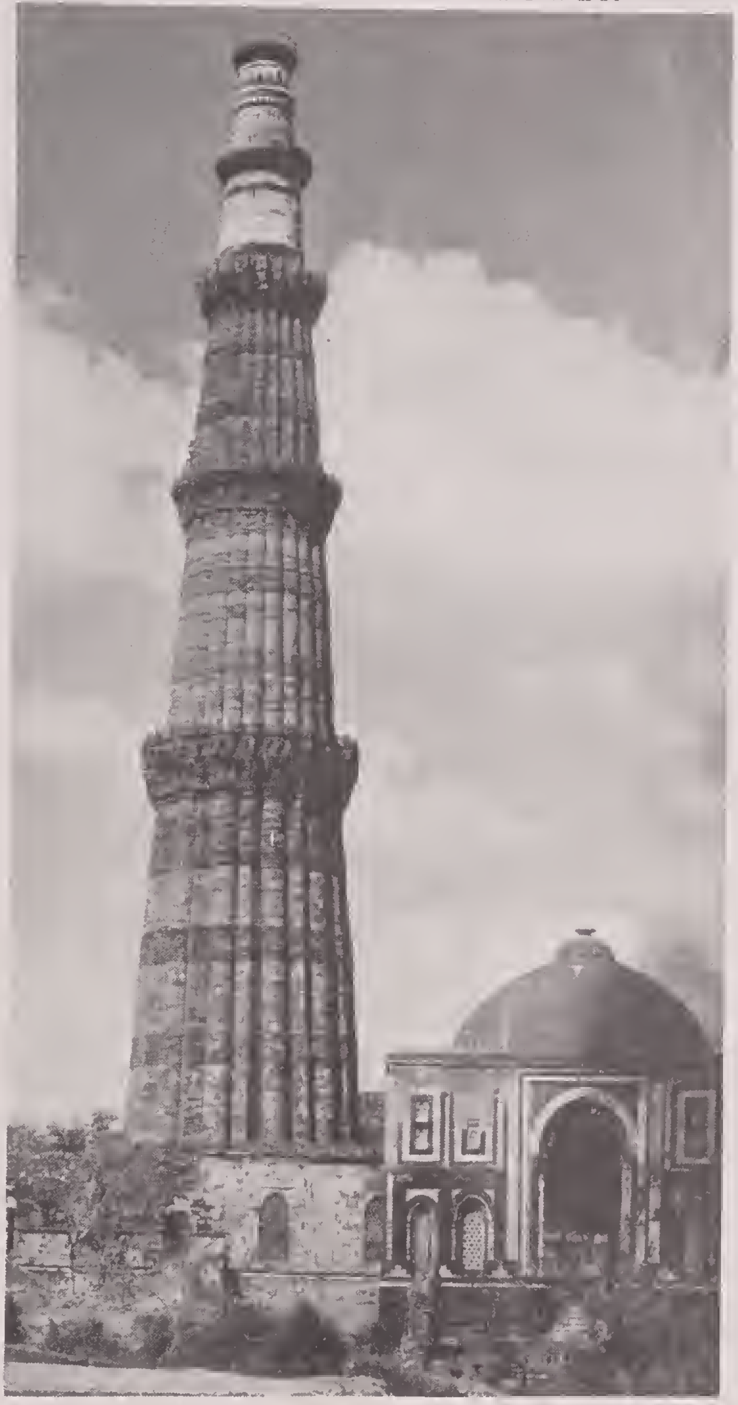


Delaware lies on the west shore of the funnel-shaped Delaware Bay, with the widest part at the bay's mouth. It is in this southern portion that the state's famous fruits and most of its other foodstuffs are grown. The farming district continues north through the narrowing territory until at the very neck of the funnel in the northern part, it gives way to the factory district, in which the busy cities of Newcastle and Wilmington are to be found. Wilmington is the center of Delaware's two most important industries—iron and steel manufactures, including car building and shipbuilding, and the manufacture of finished leather and leather products. The third most important industry is canning foodstuffs, principally fruit. The divided circle above shows the relative importance of farming and industries in the state. The topography of the state, as may be judged from the map, is uniform, for Delaware is practically level, with an average elevation above sea level of fifty feet. Its coast line is sandy along the Atlantic, and marshy along the bay. Nearly one-sixth of the state's total area of 2,370 square miles is under surface water. The principal harbors of Delaware are located at Wilmington, Newcastle, and Lewes.

The state is governed under a constitution adopted in 1897—the fourth since its foundation. The others were respectively dated 1776, 1792, and 1831. The unit of local government is the "hundred," a district once important to the old English in the administration of England but which has now practically disappeared; it was intermediate between the township and the county.

Delaware takes its name from Lord de la Warr, an Englishman who visited Delaware Bay a year or two after its discovery by Henry Hudson in 1609. The first settlement was made by the Dutch in 1631. Seven years later Sweden embarked on its sole colonizing enterprise in America, sending a mixed company of Swedes and Dutch who founded the colony of New Sweden where Wilmington now stands. The region was also claimed by the Dutch, and there were frequent conflicts until Swedish rule was ended in 1655. Eleven years later the Delaware settlements passed into the hands of the English, with the conquest of New Amsterdam (New York). The Duke of York, who received Delaware from the English king, soon granted it to William Penn. From 1683 until the Revolution Delaware remained closely connected with Pennsylvania, though it had a separate legislature after 1703. It became a separate state in 1776, and in 1789 gained the distinction of being the first commonwealth to ratify the Federal Constitution. Although a slaveholding state, Delaware adhered to the Union in 1861, furnishing troops so promptly and in such numbers that Lincoln said in his message of Dec. 3, 1861, "Noble little Delaware led off right from the first." The descendants of the original Swedish and Dutch settlers are an important element in the population of Delaware still, together with the Scotch-Irish and Quakers who came in later.

DELHI'S "PERFECT TOWER"



Among the many architectural gems of Delhi is this magnificent tower, called the Kutb Minar. Its different levels, done in colors ranging from red sandstone at the bottom to orange at the top, where it meets the blue Indian sky, form a picture which can never be forgotten.

In Kent County and in Indian River "hundred" are found a people with a curious history, who are called "Moors" or "White Indians." According to tradition, these people are descended from the crew of a Moorish vessel, wrecked and cast ashore in colonial days. They do not intermarry with whites or negroes.

Delaware Bay, the estuary of the Delaware River, is 65 miles long and in the center about 30 miles across. The channel varies in depth from 30 to 60 feet. It is one of the principal breaks in the coast of North America.

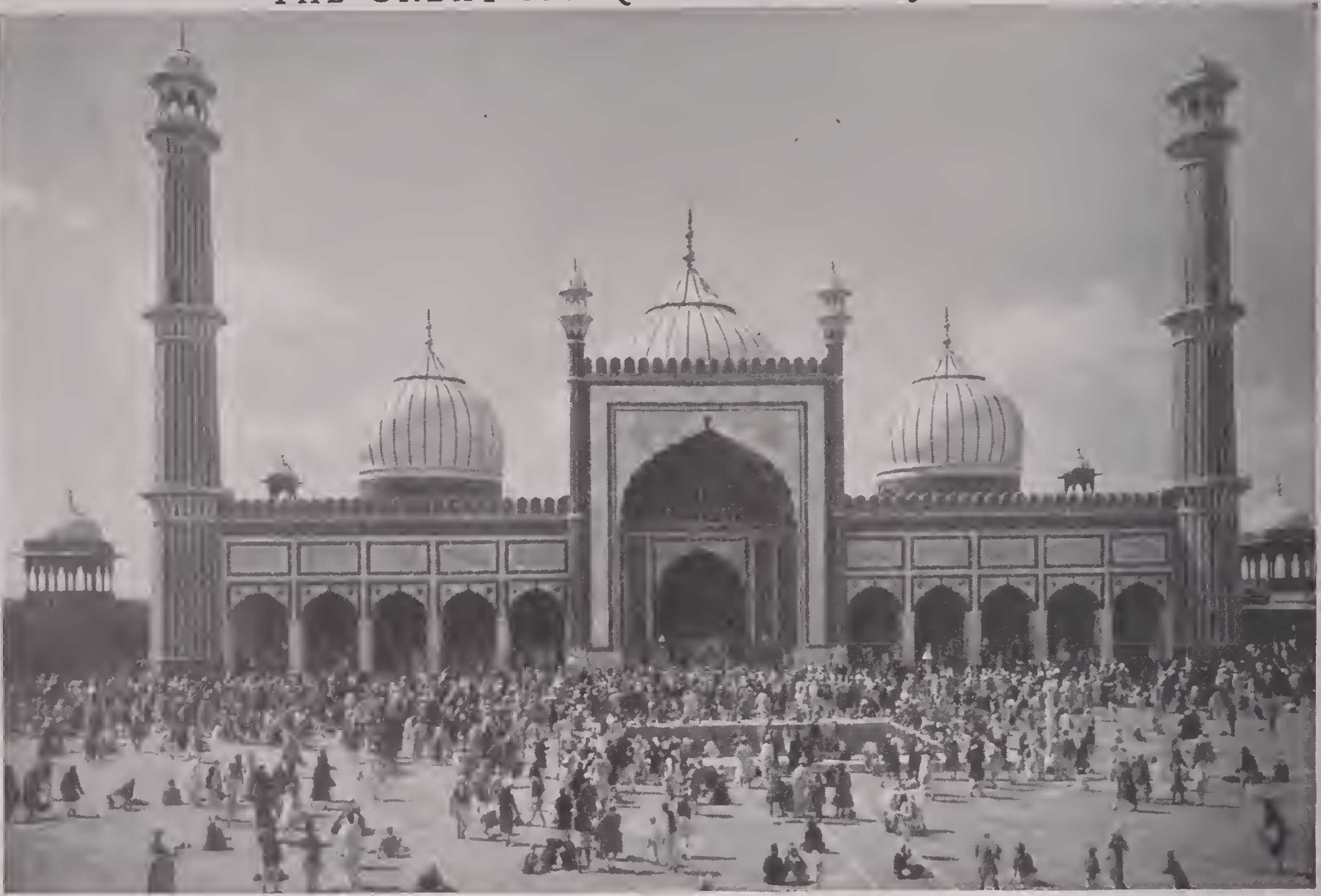
DELAWARE RIVER. Rising in two branches on the west slope of the Catskill Mountains, the united stream of the Delaware River is formed at the New York-Pennsylvania boundary. For about 70 miles it forms the boundary between those states and then turns southward, separating Pennsylvania from New Jersey. Passing by Trenton, Philadelphia, and Wilmington, it empties into Delaware Bay, after a course of 360 miles.

Near Stroudsburg, Pa., the Delaware River flows through the famous Delaware Water Gap—a narrow gorge in the Kittatinny range of the Appalachians. The gorge is about 3 miles long and the sides rise 1,400 feet sheer above the stream. The falls along the upper course of the river provide valuable water power. It is navigable for ocean-going vessels as far as Philadelphia and for lighter steamers as far as Trenton.

DELHI (*dĕl'ē*), **INDIA.** Chandni Chauk ("silver street"), the "Broadway" of India's capital, is a mile-long three-ringed circus of interest to the European visitor. A native bazaar stretches down its center, and both sides of the wide street are lined with the tiny "open-faced" shops of the East.

Here are the booths of the sweetmeat sellers, where cubes and balls of coarse sugar are displayed in glistening copper pans. Near by is the tiny shop

THE GREAT MOSQUE OF SHAH JEHAN



This magnificent mosque, built at Delhi by Shah Jehan in 1650, is one of the largest Mohammedan buildings in the world. Situated on a small rocky eminence, its white marble domes and its graceful minarets are visible from afar. The great front court in which the crowd of worshipers is gathering is paved with granite and marble.

of the man who smears thick *pawn* leaves with lime and a red paste called *kutta*, adds chopped areca-nut, and with a little twist finishes the universal betel "chew" of India. Here too are grain stores where corn, wheat, rice, and millet are sold, along with spicy cardamon seeds and sweet oily sesame seeds. The barber, who also conducts a matrimonial bureau, chats without budging from his Buddha-like pose with his next-door neighbor the tailor. The *click! click!* of the sugar-cane vendor's shears, clipping off an anna's worth (about 2 cents) of inch-long bits, is almost drowned by the heavy *thud! thud!* from across the way, where gold and silver are being beaten into thin threads to be woven into the gorgeous scarfs—the *saris* and *chudders* of the rich.

Crowded streets, bobbing two-wheeled *ekkas* jostling a wedding procession, gesticulation, chatter, good-natured confusion; the clear round tones of money being rung to see if it be true or false; the mingled odors of frying *ghee* (clarified butter), burning cow-dung, and leather; half-fed thin bodies and faces always sober—such is the heart of native Delhi.

The lofty city wall incloses a maze of mean little streets, most of them crooked and narrow. Their squalid houses contrast pathetically with the regal splendor and limitless magnificence of the mosques and palaces of the former Mogul emperors at the east of the city and skirting the Jumna River, in a walled inclosure known as Delhi Fort. Here are some of the most splendid buildings in India.

The Pearl Mosque, one of the gems, is simplicity itself. Through heavy bronze doors, beautiful with bold arabesque, one enters a dreamland—white marble everywhere, the floor, the fountain in the center of the pool, the columns and arches, the exquisite frieze above. Its three pearly domes are surmounted by inverted lotus blossoms, out of which rise slender gilded spires, like gold beads.

Before the Diwan-i-Am, the hall of public audience, one stands overcome by its suggestion of power and majesty. In front of a deep recess at the back of the central arcade rises a massive canopy of pure white marble, borne by four columns and surrounded by a low marble rail, all inlaid in delicate patterns with semi-precious stones. Beneath it once stood the famous Peacock Throne, of solid gold and on legs of gold, all gem encrusted; behind it the outspread tails of two peacocks were, like the inner canopy of gold, supported by 12 gold columns, set thick with sapphires, emeralds, rubies, and pearls. This blaze of beauty and rare stones proved too much for the cupidity of the Persian invader Nadir Shah, who sacked Delhi in 1739 and carried the throne to Persia.

Here too were once gardens and fountains, kiosks and harems of pure white marble, beauty and gorgeousness without end, of which scarcely a vestige remains, much of it having been done away with to make room for the British barracks.

The World's Most Perfect Tower

Among the wealth of beauty and magnificence in and about Delhi, one of the most wonderful sights is the Kutb Minar, said to be the most perfect tower in the world. It stands ten long dusty miles outside the city in the midst of the vast pile of ruins telling of Delhi's ancient greatness, when it was the largest city of India. Soaring 238 feet above the plain, the Minar is seen from afar; its sandstone sides deeply fluted and shading from purplish reds through pink to orange in the topmost of its five balconied stories —at once a tower of victory and a hymn of praise to Allah, whose followers built it.

The British section of the city contrasts sharply with the native quarter. It is a district of well-kept roads, shady lanes, and spacious compounds inclosing comfortable bungalows; of European hotels and handsome new government buildings. About a mile outside the town is the famous Ridge—a rocky height of some 60 feet—which was the British base during the siege of Delhi after it had been captured by the mutineers in 1857. Delhi was the center of operation of the rebels, and much of the city was destroyed in the five months' siege.

Since Delhi superseded Calcutta, in 1911, as the capital of India, it has recovered much of the prominence it had in earlier days as the capital of the Mogul emperors. Its central position in the southeastern corner of the Punjab (almost the same distance from the two great eastern and western ports of Calcutta and Bombay), with several railroads, and great thoroughfares along which pilgrims and caravans have traveled for centuries, gives it both commercial and political importance. There are many modern cotton mills and factories side by side with the ancient industries—gold and silver filigree work, jewelry, woolen fabrics, potteries, and wood-carvings, which have made the bazaars of Delhi famous.

Because of its ancient prestige, Queen Victoria chose Delhi as the seat of the great durbar (court) in 1877 when she was proclaimed Empress of India, and similar ceremonies were held at the accession of King Edward VII in 1903 and George V in 1911. Population, about 235,000.

DEL'PHI. In a gorge of lofty Mount Parnassus, overhung with towering cliffs, near the sacred fountain of Castalia—in the midst of perhaps the grandest and most awe-inspiring scenery in Greece, and (according to ancient belief) at the exact center of the habitable earth—was the famous oracle of Delphi. Here, it was believed, Apollo, the god of light, of poetry and music, and of prophecy, made known to men the will of Heaven; and here came inquirers from every part of Greece and from many other lands seeking his guidance.

In ancient days there was a cleft in the rock, whence issued volcanic vapors of strange potency. A priestess, known as the Pythia, having bathed in the fountain of Castalia and eaten of the leaves of the sacred laurel, took her seat on a tripod placed over the cleft, and inhaling the intoxicating vapors was thrown into an inspired frenzy or trance. The mystic words she uttered were taken down, put into verse form, and delivered to the inquirer as the revelations of Apollo. The oracles were usually expressed in obscure or ambiguous language and hence were capable of being interpreted in various ways. In the story of Croesus we read how such a response was given to this famous king before he went to war against the Persians (*see* Croesus).

No one who sought counsel at Delphi approached without gifts, and great treasuries were built to hold the offerings, often of pure gold or silver, presented by kings, states, and individuals. So many statues were erected that even after 500 of them were removed by the Roman emperor Nero, 3,000 remained. Recent excavations have laid bare the ruins of the great temple and many other buildings and many beautiful works of sculpture and thousands of inscriptions of historical value have also been found.

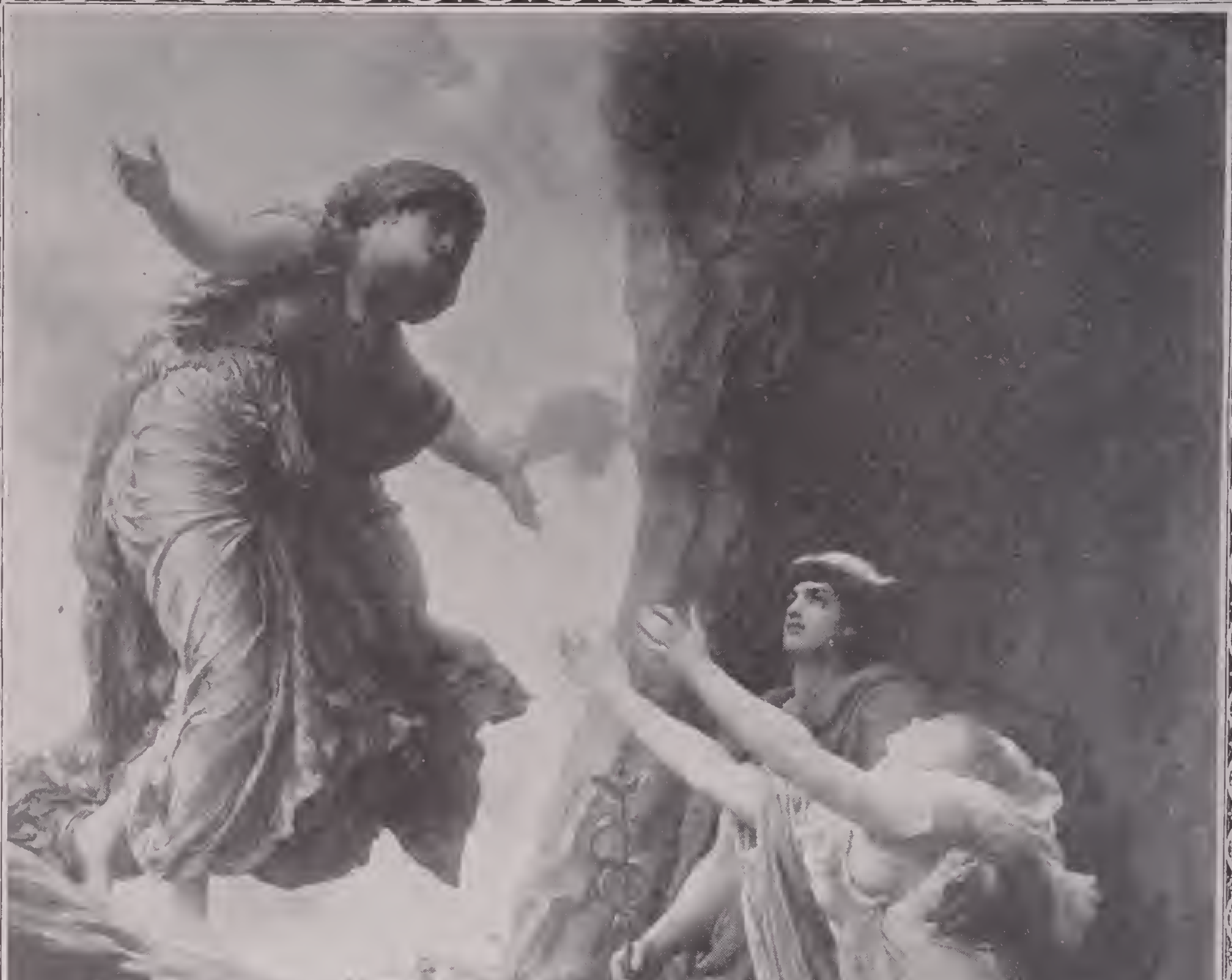
The oracle at Delphi was always consulted before any important step was taken by the ancient Greeks in affairs of state; and thus it exerted a powerful influence on the history of the Greeks. The common reverence for its utterances, and the Pythian festivals which were held at the shrine every four years, were among the chief influences making for unity in the political and religious life of the Greek world.

The Delphic oracle, though the most celebrated, was only one of several Greek oracles. The oldest was that of Zeus at Dodona, in Epirus, where Zeus was believed to speak through the rustling of the leaves of the sacred oak tree. There were also oracles in Rome, Egypt, Babylonia, and other countries.

DEMETER (*dē-mē'tẽr*). The early Greeks were much struck by the yearly change of the seasons, from the joyous and fruitful summer to the bleak desolation of winter. They found the explanation in the stories which they told of the goddess Demeter. She was the sister of Zeus (Jupiter), king of the gods, and was one of the greatest of their deities. The Greeks called her "grain-mother" or "earth-mother," and worshiped her as the goddess of agriculture and of civilized life.

According to these stories, there was at first no winter but the earth smiled green and fruitful in perpetual summer. But one day, while Demeter's lovely daughter Persephone was gathering flowers in a meadow with her playmates, the earth opened and Hades (Pluto), the god of the dead, appeared and carried her off to be his queen in the world below. Demeter was inconsolable, and torch in hand she sought her missing child throughout the wide world. All that year not a stalk of grain grew, and man would have died of hunger if Zeus had not persuaded Hades to let Persephone go. Unfortunately she had eaten a pomegranate with Hades, and so could not stay

THE RETURN OF PERSEPHONE TO HER MOTHER



The famous British artist, Sir Frederick Leighton, has interpreted in this picture the joyful welcome that Demeter, goddess of agriculture, gave her daughter, when the latter was returned to her from the Realm of the Dead. She is escorted by Hermes (Mercury) who acted as guide to and from the kingdom of Hades. The picture might have been called "The Return of Spring," for, according to the legend, it was only when Persephone was with her that Demeter would consent to make the grass and the flowers grow upon the earth. The original of this painting, executed in 1891, hangs in the Leeds Gallery, England.

away forever. In the end it was arranged that Persephone should spend two-thirds of every year with her mother and the heavenly gods, and the rest of the year with Hades in the world of the dead. So, during spring, summer, and autumn, earth blooms and bears fruit, and during the winter the life of vegetation sleeps buried under ground.

At Eleusis, in western Greece, the Greeks held an annual festival in honor of Demeter, with secret ceremonies. Those who were initiated into these Eleusinian mysteries found a deeper meaning in this myth. To them it held forth the promise of a future life beyond death.

The Romans worshiped Demeter under the name of Ceres, which gives us the word "cereal," and called her daughter Proserpina.

DEMOSTHENES (*dē-mŏs'thĕ-nēz*) (about 383–322 B.C.). If any of the Athenian friends of the youthful Demosthenes had foretold that he would become the most famous orator not only of Greece but of all history, the prediction would have moved those who heard it to derisive laughter.

"A great orator, indeed!" they would have replied. "Why, Demosthenes is the least likely lad in all Athens for public speaking. Look at him! He is a puny, spindling fellow. He is clumsy and awkward, and one shoulder is higher than the other. His voice is thin and weak, and he has an impediment in his speech. A great orator? Nonsense!"

But a great orator Demosthenes was determined to be, and a great orator he became. Even to this day, the student who wishes to master the art of eloquence studies the speeches of Demosthenes as the supreme masterpieces of any age. Perhaps one impulse that moved the young Athenian to entertain this ambition was the desire to obtain justice against his two cousins, who had mismanaged the goodly estate his father had left him, and had turned over to him only about one-seventh of what he should have received when he came of age. At any rate, Demosthenes did plead his case against one of his unjust guardians in later life, and won a verdict for damages.

When he first tried to speak in the public assembly, he was only laughed at. But Demosthenes had the kind of will that triumphs over all obstacles. To learn to articulate more distinctly, it is said that he practiced speaking with pebbles in his mouth; and to strengthen his voice he declaimed on the seashore amid the roar of the waves, or ran up hill as he recited. To overcome his awkward habit of lifting one shoulder higher than the other, he hung a sword so that it would touch his shoulder if he raised it. He fitted up a room in a cave, where he could study and practice without interruption. Often he sat up at night, writing and rewriting his speeches by the glimmer of an oil lamp. A man who was jealous of him once referred to this with a sneer, saying, "Demosthenes, your speeches smell of the lamp."

Success crowned his efforts, and Demosthenes at length rose to popularity and power, just at the time when a great danger threatened Athens. King Philip, who ruled Macedon, just north of Greece, was beginning those conquests which in the end made him master of Greece. Demosthenes, foreseeing the danger, urged his countrymen in one eloquent appeal after another to arise and preserve their freedom. His powerful orations against Philip were known as "philippics," and they became so famous that today any impassioned denunciation or criticism is called a "philippic."

DEMOSTHENES
"The Greatest Orator of All Time"

Only when it was too late did the Athenians heed the warnings of Demosthenes. Darker days followed for the great orator. The pro-Macedonian party, which had for its spokesman Aeschines, an orator second only to Demosthenes, obtained his condemnation on a false charge of taking a bribe. He was fined and thrown into prison, from which he fled into exile. When Alexander the Great of Macedon died, Demosthenes was recalled and led a last attempt to throw off the Macedonian yoke. Defeat put an end to the hopes of the patriots, and Demosthenes had to flee for his life. When overtaken by his pursuers, he begged leave to write a letter. For a few moments he was seen to chew a pen, as was his habit when writing or thinking. But in the hollow of that reed he kept poison for just such a crisis. Soon he began to tremble, and rising up, he tottered and fell dead.

Demosthenes' greatest oration, entitled 'On the Crown', was delivered in 330 B.C. It was a review and justification of his public life, in answer to the criticisms of his enemies, and is the most splendid example of ancient oratory that has come down to us.

STURDY LITTLE DENMARK *and its* PROGRESSIVE PEOPLE

Extent.—Area, 16,585 square miles (11,428 in the peninsula of Jutland, the remainder in islands). Population, about 3,250,000.
Chief Products.—Wheat, oats, rye, barley, potatoes, root crops; live stock, hides, and dairy products; cod, haddock, and other fish; porcelain, paper, wooden clocks, etc.
Chief Cities.—Copenhagen (capital; 510,000 population); Aarhuus (66,000); Odense (45,000).

DENMARK. A peaceful smiling landscape of gently rolling farmland, low hills, and dense forests of venerable beeches, wooded shores, and shallow lagoons, and always a view of the crisp blue waters of sea or lake, stream or fiord, dotted with innumerable little white-sailed boats—these are some of the pictures that linger long in memory after a visit to the little Scandinavian kingdom of Denmark. And as the dream pictures come back we recall the neat little villages with their single long cobbled street and their square-towered church; and the pretty little farms with low white plastered buildings topped by red-tiled or heavily thatched roofs, and likely as not a large stork's nest in the chimney, for the stork is very much at home here and seems to be Denmark's own bird.

DENMARK'S STURDY WOMEN

The little Danish kingdom owes much of its prosperity to its energetic farm women. Here are three women of this class, in their quaint peasant dress.

These farm buildings are very substantial — almost never do you see a frame building of any sort in Denmark; and they are always built in the form of a square surrounding an inner courtyard. In front is the carefully fenced garden filled with a profusion of flowers, berry bushes, and fruit trees, and always a pretty little summer-house where the family enjoy their meals during the summer months, for the Danes love the out-of-doors and make the most of the short hot summer. Adjoining farm lands are rarely separated by fences since it has been found to be more economical in many ways to do away with these. The cattle are not permitted to roam in the pasture but are very carefully tethered. More often they are kept in their well-ventilated stalls the year around and the freshly cut clover is brought to them there, for the Danes have found that the cows give more and richer milk when they are not bothered by the flies and the hot sun of the fields.

Denmark proper occupies the peninsula of Jutland (about the size of Vermont) and a group of adjacent islands, the largest of which are Fünen and Zealand, lying between Germany on the south and Sweden to the north and east. To the west is the North Sea and on the east the Baltic. The southern border of Denmark now extends through the middle of the province of Schleswig, since North Schleswig, after the World War, decided by a plebiscite, or vote of the people, to reunite with Denmark rather than with Germany, to which it was forcibly annexed in 1864. On the north and east Denmark is separated from the other Scandinavian countries by the shallow waters of the Skagerrack, the Kattegat, and the Sound.

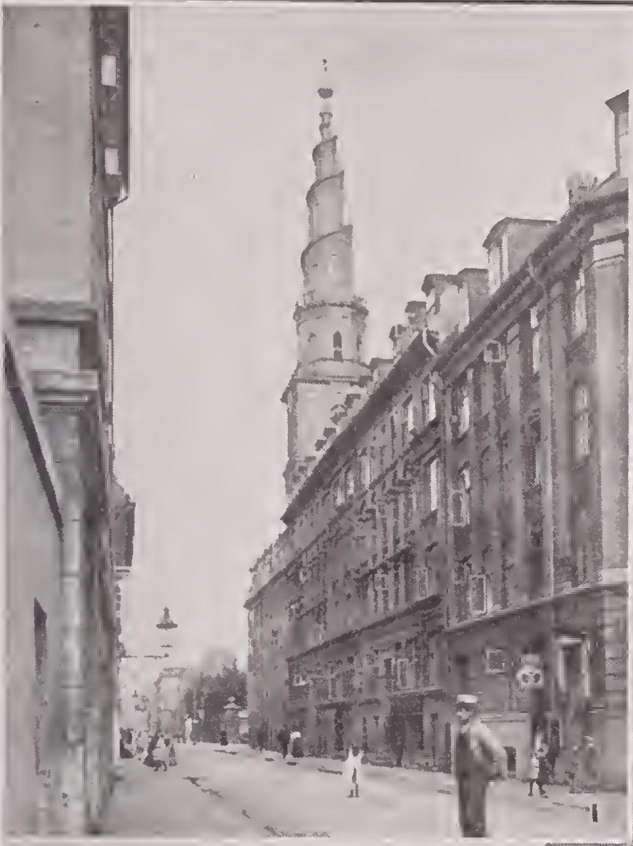
Fishermen and Farmers

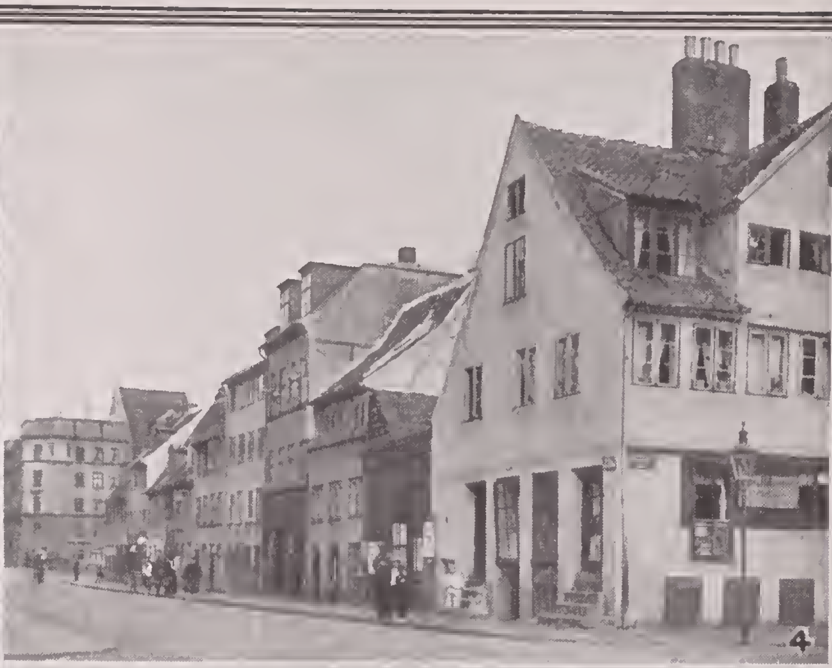
Since the peninsula is almost entirely surrounded by water, and has many fiords extending far inland, the fishing industry has been greatly developed. Almost the entire coast is lined with the nets and the neat little cottages of the fishermen. Fresh cod, salmon, shrimps, lobster, haddock, herring, and most of all the flounder, form an important part of the Danish people's diet, and besides their export of fish amounts to more than $10,000,000 yearly.

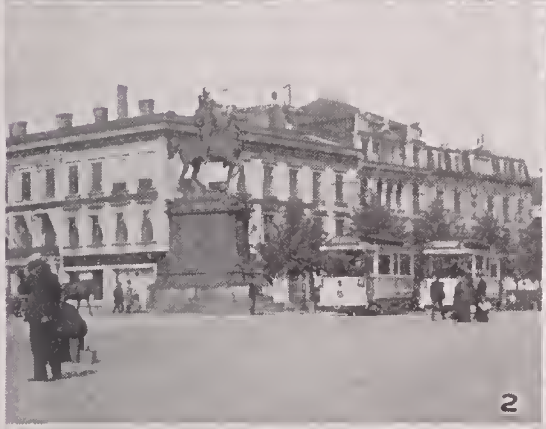
But agriculture is by far the leading industry. Two-fifths of the population are farmers and 80 per cent of the soil is productive. It is nearly all in the hands of small proprietors, because the law forbids the union of small farms into larger estates and encourages the parceling out of landed property. Extremes of wealth and poverty are therefore rare, and the spirit of the people is markedly democratic and independent.

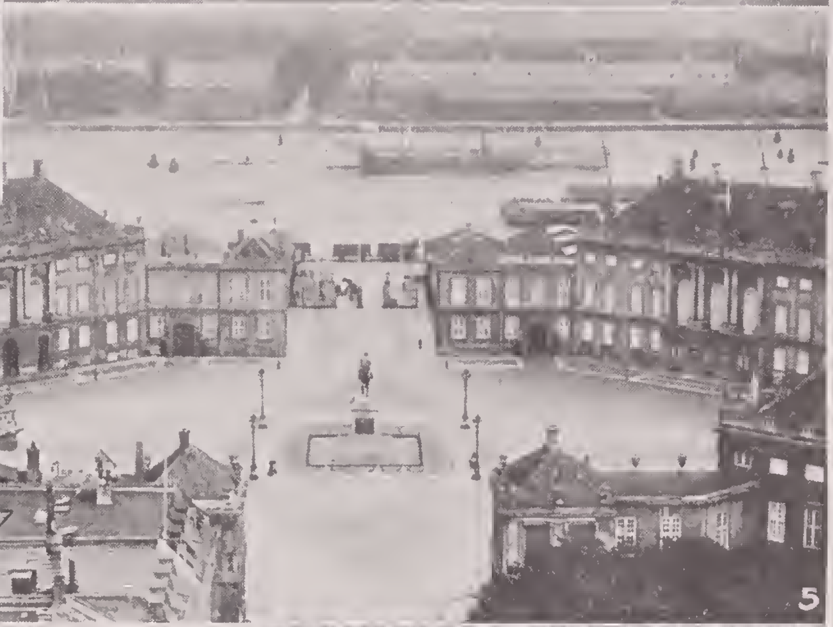
Though most of Denmark is a land of fertile fields and pleasant woods, well watered by the moist ocean winds, there are also large areas with a very different aspect; barren heaths and boggy moors and miles and miles of naked sand dunes. These regions are found in Jutland, the west coast of which is battered by the strong winds from the North Sea. Here is a barren sandy stretch more than 200 miles long and in places over 6 miles wide. The wind is so strong that the sands are constantly shifting, the coast line ever changing; no vegetation can get a foothold, and the few scattered peasants, as at Fanö, wear masks and tight head-dresses to protect themselves from the strong sandy blasts. The shallow wind-swept shores are so dangerous that sailors call this region the "iron coast." The only town of any importance is Esbjerg,

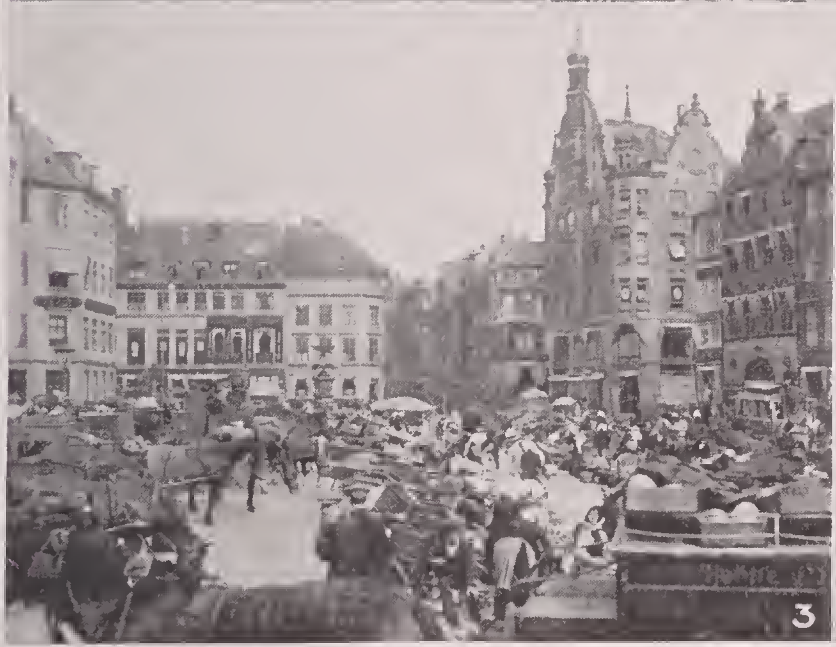
SEEING THE SIGHTS IN COPENHAGEN











If you ever visit Copenhagen, perhaps the thing you will talk most about to the folks at home when you get back is that curious tower rising above the Church of Our Savior (1). It was built in 1696, and is 282 feet high. The steps run around the outside in corkscrew fashion, tapering off to a point at the top. Next you might mention that you had seen the famous leaden statue of Christian V in the King's Market (2). At another market place (3), you get nice fresh vegetables from the Island of Amager, where the gardening is done for the city markets. In the next picture (4) we are looking at some of the quaint houses of olden days which are still plentiful in this fine old city. Below that (5) we get a good view of the Palace and the Palace Grounds. We end this sight-seeing tour about the city by feeding the pigeons in the public park. They'll gladly eat out of your hand, too, just as they are eating out of the hands of those young Danish children.

the chief port for the weekly exportation of millions of pounds of butter, bacon, and eggs.

This wide sandy belt extends to the very northernmost tip of Jutland, where, at Skagen, it ends in a tiny tongue of sand curving out into the seas and losing itself between the waters of the Skagerrack and the Kattegat. How dear to the hearts of the Danes is Skagen, with its blue skies, clear air, green reeds, yellow sand in dunes and flats, and on both sides the ever changing seas! What an inspiration it has been to the poets and the painters and the summer guests that flock there every year! Holger Drachmann, the greatest Danish poet of his time, expressed the sentiments of the people when he said:

> There is a soul in Skagen
> Which never can grow old.

Through the middle of Jutland, from north to south, are the peat beds, the moors and the heaths, lonely desolate barren places with a charm all their own.

> Beautiful to me are the flowerless fields,
> My brown heath is a Garden of Eden.

So sang Blicher (1782–1848), the Danish heath poet, who did so much to arouse the spirit of the people to an appreciation of their national independence. Great changes have taken place in the heath since Blicher's time; railroads and telephones have done much to lessen the dreadful loneliness of the life there, and most important of all, half of the heath has been reclaimed through the efforts of the patriotic Heath Society. They plowed up the heather and planted trees, dug canals and drained the marshes, until now it is in a fair way to become what it was several hundred years ago, before the forests which once covered its slopes were so ruthlessly cut down.

Lakes, Streams, and Fiords

Along the eastern coast of Jutland we find the typical Danish landscape of fertile fields and beautiful woods, many wonderfully beautiful little lakes, streams, and fiords. Here are the highest hills of Denmark, all under 600 feet high, and the main towns of Jutland—Veile the beautiful, Horsens, Mariager, Randers, and Aalborg, each at the head of its own fiord; and Aarhuus (66,000), the second largest city of Denmark, the seaport and chief town of Jutland.

East of Jutland, across the waters of the Little Belt, is the island Fünen, the garden spot of Denmark, where there are many large estates. Its chief city Odense (45,000), the third largest city of Denmark, is named from the Norse god Odin by whom it is fabled to have been founded. Here Hans Christian Andersen was born.

Zealand, the largest and most important of the Danish islands, contains the capital, Copenhagen; it lies east of Fünen, from which it is separated by the Great Belt. South of Zealand are the islands Laaland and Falster, and Möen with its beautiful chalk cliffs, and almost a hundred miles farther east in the Baltic is the rugged picturesque island Bornholm, its bare granite cliffs rising abruptly out of the sea and presenting quite a different aspect from the rest of Denmark. On Bornholm they still use the "carriage and pair," having prohibited the use of automobiles. This island is the only part of the home country of Denmark that has any considerable mineral resources, furnishing a little coal, building stone, and porcelain clay.

Denmark's Marvelous Progress

Though small in size and in the number of its inhabitants, Denmark has shown very great progress during the last hundred years. It ranks with the leading nations in education and scientific agriculture, and in the number and excellence of its coöperative enterprises it is without a rival. Education is compulsory and every child over seven years of age can both read and write. The university and professional schools are known for their excellence, their thoroughness, and their splendid democratic spirit. Excellent agricultural schools and many experiment stations keep the farmers informed of all the latest improvements in agriculture, in farm implements, and in the care of stock, and the farmers are quick to take advantage of these opportunities.

It has been said that in Denmark a farmer who has one egg to export can export it through the coöperative societies, and this is literally true. In 1882 the first coöperative dairy in Denmark was founded by a group of farmers with such success that at present there are more than 1,200 such dairies, besides hundreds of other coöperative societies for testing cows, and for the exportation of butter, bacon, and eggs. These societies are an especial boon to the small farmer, and they have been responsible for making the Danish products uniformly excellent and for increasing the output, making Denmark the largest exporter of butter among all the nations, with an annual output of more than 200,000,000 pounds.

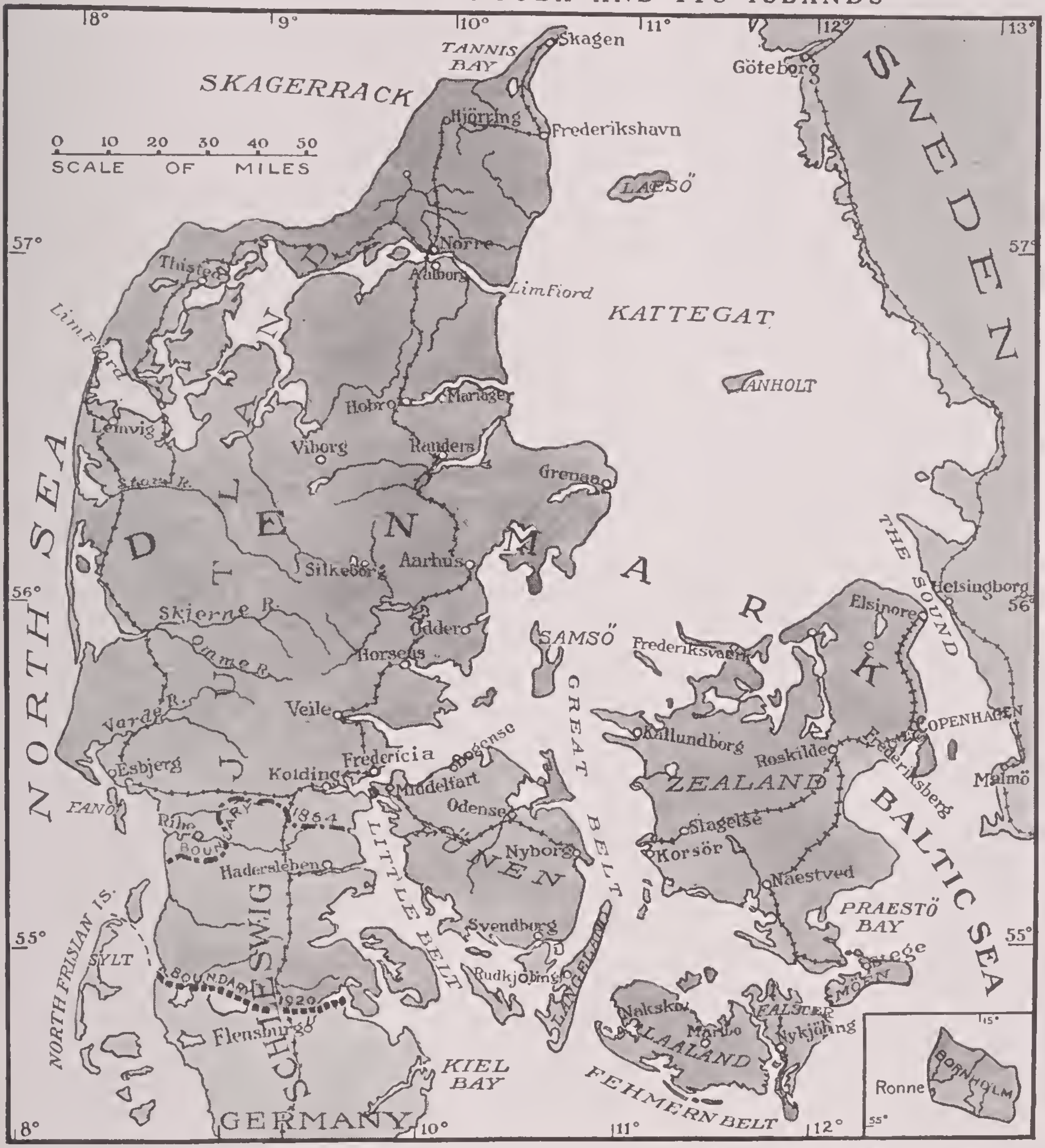
But it is probably the royal Copenhagen porcelain more than any other product of this little country which has spread the fame of Denmark all over the world; the delicate coloring of this famous ware in soft grays and blues and its beautiful and artistic designs are universally admired and coveted.

One-fifth of all the inhabitants of Denmark live in Copenhagen, the capital city, and they are a joyous optimistic folk, truly democratic and extremely fond of outdoor life and sports. From the earliest spring when the beeches appear in their first delicate green until the late autumn when they become a mass of gold, the Copenhageners miss no opportunity to flock to the woods within easy reach of the city. Copenhagen is a beautiful modern city, occupying a position of great strategic importance, since it commands the entrance to the Baltic Sea. During the World War Denmark, lying as it were between the two belligerents, was overrun with refugees from both sides, making its position most difficult; but throughout the war it maintained a rigorous neutrality.

Back to the Days of the Vikings

Since 1849 Denmark has been a constitutional monarchy with the legislative powers vested in the king and the parliament, which consists of an upper house and a lower house chosen by the people. The franchise is enjoyed by all tax-payers over 25 years of age, Danish women having won the vote in 1908. Religious freedom prevails, but nearly 99 per cent belong to the state church, the Lutheran.

THE DANISH PENINSULA AND ITS ISLANDS



It is a rich and pleasant land for the most part, this country of the Danes. From Skagen, "that tiny tongue of sand curving out into the seas," down through the lonely moors and heaths of Jutland, and throughout that group of great islands that nearly close the mouth of the Baltic, order and prosperity reign. The island of Bornholm, shown in the square at the lower right-hand corner, lies a considerable distance to the east in the Baltic. The map shows the portion of Schleswig which was reunited with Denmark after the World War.

Denmark's history goes back to the dim twilight of the saga-period, out of which loom the figures of the Viking heroes. The Cimbri, a Teutonic people, had inhabited the peninsula about the beginning of the Christian era. From its base the Jutes and the neighboring Angles and Saxons had set sail in the 5th century to conquer England. The Danes are first mentioned by name in the 6th century; in the 9th and 10th centuries they were the most prominent of the "Northmen" whose Viking ships raided the coasts of Europe.

The missionary Ansgar baptized a Danish king in 826. Gorm the Old, who first united the islands and the mainland under one rule, opposed Christianity; but Canute his grandson, the conqueror of England (died 1035), was its zealous friend. During the reigns following that of Canute, the nobles grew powerful by means of the feudal system and ground down the once free people to serfs.

In 1397 Queen Margaret of Denmark united the three Scandinavian countries of Denmark, Norway, and Sweden, in the union of Kalmar, which lasted until 1523, when Sweden broke away. Denmark and Norway remained united until 1815, when the Congress of Vienna joined Norway to Sweden because Denmark had sided with Napoleon. Fifty years later Denmark was attacked by Prussia and Austria and lost the provinces of Schleswig and Holstein, which had recently been incorporated in the kingdom. The northern third of Schleswig was returned to Denmark after Germany's defeat in the World War of 1914–18, but by a "plebiscite" (vote) of the inhabitants the second zone (about Flensburg) remained under German rule.

In addition to the peninsula of Jutland and adjacent islands, Denmark rules the Faroe Islands (700 miles to the northward on the route to Iceland) and the distant island of Greenland. Iceland, long possessed by Denmark, is now united to that country merely by having the same king. (*See also* Canute; Christian; Copenhagen; Northmen; Scandinavia.)

DENTISTRY. Artificial teeth and gold mountings existed in Roman days, but the care of the teeth was crude, and it was not until the middle of the 19th century that dentistry became recognized as a separate and important science. Even for years after that dentists dealt chiefly with filling cavities, extracting teeth, and making "false" teeth for those who, through lack of care, had lost their natural teeth.

To the members of the profession in the United States belongs the honor of having first preached the all-important doctrines of dental hygiene, which includes the proper care of the teeth and mouth to prevent infection and decay. It is generally recognized today that many diseases are caused by germs which gain entrance to the body through neglected teeth and gums. An apparently healthy tooth, for instance, may have at its roots a painless abscess, which constantly infects the blood, causing inflammations of the bone or nerve sheaths, as in rheumatism, sciatica, etc.

The training of the modern dentist, therefore, requires more than mere mechanical skill. He must have a complete knowledge of the anatomy of the mouth, of the structure of bone and flesh tissues, and the diseases which affect them. He must be a competent surgeon in his field, and have a sufficient knowledge of general medicine to diagnose ailments which might be due to defective teeth, and recommend the proper treatment. For special work, a practical knowledge of anesthetics and of the use of the X-ray is required.

So important has proper dental work become that many large cities maintain dental clinics where children particularly can receive the necessary care, and dental inspection is often carried out in the public schools at municipal expense.

The degree conferred upon students who have completed the required course in dentistry is designated in most institutions as Doctor of Dental Surgery (D.D.S.), though some important schools use the title Doctor of Dental Medicine (D.M.D.). In the United States Army the Dental Surgeons' Corps occupies a position equal in rank and pay to that of the Medical Corps. (*See* Teeth.)

DENVER, COLO. Situated on the line which divides the great American plains from the Rocky Mountains, Denver, the capital of Colorado, enjoys natural advantages which have made it the largest city between the Missouri River and the Pacific Coast. To the east the rolling prairies, dotted with thriving farms and stock ranches, stretch away to merge in the plains of Kansas. To the west, less than 15 miles distant, the foothills of the Rockies turn abruptly into lordly mountains. The chief peaks of the Continental Divide, from Pikes Peak on the south to Longs Peak on the north, are plainly visible from any high point in the city.

Denver lies at the juncture of Cherry Creek and the South Platte River. This was a favorite camping place for "forty-niners," as the bold adventurers were called who joined in the gold rush of 1849 to California. It became a regular settlement in 1858, when campers, delayed by the snow in the mountain passes, found "pay dirt" in the nearby hill streams. Ever since that time Denver has owed much of its prosperity to the wealth of mineral deposits in her guardian mountains. Later the city became an extensive distributing point, gained large manufacturing plants, and throve by trade in farm and fruit products. The smelting and refining of lead is a leading industry, but copper, gold, silver, and iron smelting are also important. Denver is known also for its large foundries and machine shops, its flour and grist mills, its slaughtering and meat packing, and it is the central livestock market of the Rocky Mountain region.

By reason of its altitude—one mile above sea-level—and on account of its clear air, sunshine, and mountain scenery, Denver has become a great tourist and health center. However, it is more than a city of hotels, restaurants, and souvenir shops. It is a fine all-year-'round city as well, with attractive stores and homes on broad streets, and with many municipal parks and an extensive boulevard system.

Denver is 2,025 miles from New York City and 1,457 miles from San Francisco, and it is served by several important railway lines. One of these, the Denver and Salt Lake railroad, winds its way through tunnels and gorges in the mountains, rising in a few hours to an altitude of more than 11,000 feet, and offers along the way a view of some of the most impressive scenery in the world.

Denver is the seat of a United States mint, and has one of the largest federal buildings in the United States, from which much of the important work of the Reclamation Service is carried on. The University of Denver, founded in 1864, is the oldest college in the Rocky Mountain States. Among its many churches, St. John's cathedral (Episcopal) and the cathedral of the Immaculate Conception (Roman Catholic) may be mentioned for their architectural beauty.

The city was incorporated in 1858 and named in honor of Gen. James W. Denver, then governor of Kansas Territory, of which Colorado at that time formed a part. Population, about 260,000.

DES MOINES (*dē mŏin'*), IOWA. The center of a land of plenty; a thriving, progressive city in the midst of the world's greatest agricultural empire; an educational center and one of the industrial leaders among middle western communities—that is Des Moines, capital and largest city of Iowa and a monument to the solid prosperity of the region which it dominates.

Several railroads and interurban lines bear a rich freight to Des Moines—grain from Iowa's fertile soil to be milled into flour and other products; coal from the bituminous fields near by to supply fuel for the city's industries; live stock from Iowa's green pastures to supply packing house and tannery; wool to be fashioned into textiles and clothing. Smoke pouring from numerous stacks attests the growing importance of Des Moines as an industrial center, while the city's hundreds of miles of paved streets and electric car lines, its many beautiful public buildings, its famous park system, and its boulevards lined with comfortable residences indicate the wealth of the people.

Des Moines is a city of schools. In addition to its public school system, it has more than a dozen colleges, including Drake University and Des Moines College. Its insurance business is extensive, with more than 50 home companies. More than 40 farm journals published there disseminate information among farmers. It is the site of a United States army post. The state capitol building, erected at a cost of $3,000,000, has won high praise as a noteworthy architectural achievement.

The city was settled in 1843, after the government had built a fort on its present site to protect the Sac and Fox Indians. It received its charter as a city in 1856 and became the capital of Iowa a year later, displacing Iowa City. Population, about 130,000.

DE SOTO, HERNANDO (1496?–1542). A band of tired, hungry, and disheartened men stood, one clear spring day in 1541, on the banks of a great stream in the heart of the new American continent, a stream very deep and muddy and so wide that "if a man stood still on the other side it could not be discerned whether he were a man or no." They were Hernando de Soto and his followers, the first white men to see the inland course of the mighty Mississippi which rolled at their feet.

More than three years before, De Soto had obtained from Emperor Charles V as king of Spain an appointment as governor of the vast unexplored interior of southeastern North America—called "Florida" since Ponce de Leon's discovery a score of years before—with orders to subdue and to rule it. De Soto fully expected to find such fabulous riches as he had seen in Peru when he aided Pizarro in the conquest of that land; for there were rumors of a country so rich in gold that its king was completely gilded, whence he was known as "El Dorado" or "The Gilded One."

After staying for a time in Cuba, his company of over 700 men had landed, in May 1539, in Tampa Bay, which they christened "Bay of the Holy Spirit." Captured Indians, loaded with collars and chains of iron, had guided the armor-clad explorers and performed the heavy work about the camp. But these Indian slaves proved untrustworthy, and the cruelty with which they were treated aroused the hostility of the tribes through whose country the expedition passed. Through dismal swamps and interminable pine forests, harassed by Indians, the ever-lessening company kept up its wearisome march through what are now the states of Georgia, Alabama, and Mississippi.

At last they had come to the banks of the Mississippi, just below the site of the present city of Memphis, Tenn. Still lured on by the will-of-the-wisp of fabulous wealth beyond, they built boats and crossed the swiftly flowing stream. On the other side they found other slimy bogs, dense cane-brakes, and thickets festooned with hanging vines, but nowhere a settled land and the riches of which they were in search.

Just as De Soto in despair had decided to abandon the country, he sickened and died (June 1542) on the banks of the great river he had discovered. His followers placed his body in the hollowed-out trunk of an oak tree, and screwed a plank over the opening. Weighting this rude casket with De Soto's heavy armor, they sank it one dark night in the turbid waters of the Mississippi, that the Indians might not know of the loss of their leader.

Those of De Soto's followers who were left—about 300—attempted to reach Mexico by land. But the Red River proved impassable, and so they turned back to the Mississippi. There they built seven frail vessels, and after a perilous voyage down the river and through the Gulf of Mexico they reached a Spanish settlement in Mexico, late in September 1542.

De Soto's expedition with that of Coronado, which was made at the same time, almost spanned the continent from the Atlantic to the Pacific. They had explored a vast territory in what is now the southern part of the United States, and had given Spain a claim to the whole interior of North America. (For De Soto's route, *see* historical map in article United States History.)

DETROIT′, MICH. If all the automobiles manufactured in Detroit every day were to drive away each evening, keeping 40 feet apart for safety, they would make a line more than 27 miles long. For Detroit is the automobile capital of the world, turning out more than a million cars a year.

Under the magic wand of this industry the Michigan metropolis has undergone an amazing transformation. Within 20 years from the time when Detroit began making (in 1899) its first "horseless carriages," the city leaped from 16th place among the manufacturing cities of the United States to fourth.

In the early days of the motor car the far-sighted bankers of Detroit financed several automobile-manufacturing companies when the bankers of other cities would not do so. And see what the automobile did for Detroit! It brought scores of up-to-date factories, and attracted tens of thousands of employees (more than 50,000 are employed by one company alone).

As we breathe its 20th century atmosphere, it is hard to realize that Detroit is one of the oldest cities in this country, having been founded by the French in 1701. What a contrast between the Detroit of yesterday and of today! The tall Federal Building stands on the site of the old stockade, built for the protection of the settlers from savage Indians. The former Hotel Pontchartrain on Cadillac Square also recalled names famous in the early history of Detroit; for it was Cadillac, soldier of fortune of Louis XIV, who built Fort Pontchartrain and settled it with 50 soldiers and 50 colonists.

On the streets of the city today many English and Canadian people from Windsor, Canada, which lies just across the river, mingle with the Americans in friendly fashion. In the early days, however, things were very different. During the Revolutionary War, the British, who had taken Detroit from the French in 1760, sent out from this post several Indian expeditions to ravage the American frontiers. And in the War of 1812, when Detroit was American territory as a result of the Revolution, the British captured it again and held it for a year.

Like Constantinople, Detroit owes much of its greatness to its excellent location at a natural gateway of commerce. Just as the narrow channel of the Dardanelles connects the Sea of Marmora with the Aegean Sea, so the Detroit River—which indeed is sometimes called "the Dardanelles of America"—connects Lake St. Clair and Lake Erie. The river or strait (Detroit is the French word meaning "strait") is 25 miles long and from half a mile to 3 miles wide, forming a magnificent harbor at Detroit. It carries more tonnage than any other river in the world, and more than five times that of the Suez Canal in normal years; for immense lake shipments of grain and lumber and ore for the Eastern states pass through it. During the navigation season, a vessel passes the City of the Straits on an average every seven and a half minutes. Detroit is also the gateway for a large part of the railway commerce between the Middle West and Canada.

A love for the beautiful, inherited perhaps from the French founders, has been shown by the builders of the city, both of yesterday and of today. This appears in the business and residential districts, with their many splendid office buildings and homes, and even in the manufacturing sections, where the factories are ornaments, not eyesores. The checkerboard plan common to most American cities is varied in Detroit by beautiful long avenues which radiate north, east, and west from the City Hall district. Beauty is also to be found in Detroit's many parks, particularly in Belle Isle, the city's playground. This is a 700-acre island in the Detroit River, occupied by a magnificent forest and zoölogical gardens.

Detroit would be a leading industrial center without its motor cars, for it is the first city in the manufacture of aluminum castings, adding machines, soda ash and kindred alkalies, overalls, and gas engines. It also holds a prominent position in brass manufactures, paints and varnishes, malleable iron, steel products, stoves and furnaces, dress goods, drugs, wire cloth, metal beds, lubricators, and tobacco. Detroit's manufacturing resources were of the greatest service to the United States in the war with the Central Powers, 90 per cent of the Liberty motors for airplanes being made there, besides a vast quantity of other war supplies. The population more than doubled between 1910 and 1920, being now about 1,000,000. Some of Detroit's suburbs also experienced amazing growth. Hamtramck village and Highland Park, for example, increased over 1000 per cent in the decade, growing from 3,500 and 4,000 respectively to nearly 50,000.

DEUCALION (*dū-kā'lĭ-ŏn*). When the race of men, according to Greek myth, had fallen into evil ways so that Zeus destroyed them by a flood, Deucalion, son of Prometheus, and his wife Pyrrha, alone were saved. Deucalion built an ark or ship in which he and his wife floated during the nine days' flood which covered the earth. On the going down of the waters the ark rested on Mount Parnassus. To repeople the world, Deucalion and Pyrrha were told by the oracle to throw behind them the "bones of their mother." Interpreting this to mean the stones of mother-earth, they obeyed. From the stones thrown by Deucalion sprang up men, and from those thrown by Pyrrha sprang up women; so the earth was repeopled.

DEW. The warmer the air is, the more moisture it can hold. All through the sunny hours streams, plants, and trees are giving their share of moisture to the air by evaporation. When night comes the earth loses some of its heat through radiation; its surface feels cool and clammy to the touch. The layer of air just above the earth loses its heat too, and soon reaches a point at which it can hold no more moisture. The water is squeezed out of the air as it cools, and forms in tiny little globes as dew on any solid object. In the same way warm air deposits its moisture on the surface of a pitcher filled with ice-water.

Dew does not form readily on cloudy or windy nights, because the clouds act as a kind of blanket to prevent the earth from radiating heat into space, and because wind mixes warm air with the cool air near the surface. Thus the air is cooled more slowly, and if it does not reach the point at which it can hold no more moisture—the "saturation point" or "dew point" as it is called—no dew forms.

It has been noticed that dew forms more readily in valleys and in regions where there is much vegetation. Valleys are often filled at night with cold air that slides down the hillsides because of its weight. Aside from that fact, there is apt to be more dew in valleys because there is more moisture. Streams and vegetation together contribute more of it in hollows than on steep slopes, which are often bare or have scanty vegetation. The amount of dew is rarely more than an inch per year in a well watered region.

DEWEY, ADMIRAL GEORGE (1837–1917). On the night of April 30, 1898, six United States war-vessels moved boldly into Manila Bay in the Philippine Islands. The supreme moment had come in the life of Commodore George Dewey, then in his 62d year. When war between the United States and Spain had been declared on April 24, Dewey was in command of the Asiatic squadron off Hongkong, China. He had been ordered by cable to "capture or destroy" the Spanish fleet in Philippine waters, and had sailed under full steam, his vessels stripped for action. He now confronted the war-

GEORGE DEWEY
The Victor of Manila Bay

ships of the enemy, drawn up in front of Cavite Point.

Dewey faced his task with the confidence inspired by long training and experience. Born in Montpelier, Vt., Dec. 26, 1837, he had been graduated from the Naval Academy at Annapolis in 1858. During the Civil War he had served under Farragut in the battle of New Orleans and had taken part in two attacks on Fort Fisher. After the Civil War he had risen successively through the ranks of lieutenant-commander, commander, and captain, and finally as commodore he had been placed in command of the Asiatic squadron.

In the early dawn of May 1, the American warships, steaming in column formation, bore down on the Spaniards and opened fire. Within a few hours Dewey had completely destroyed the Spanish fleet, without the loss of a ship or of a man.

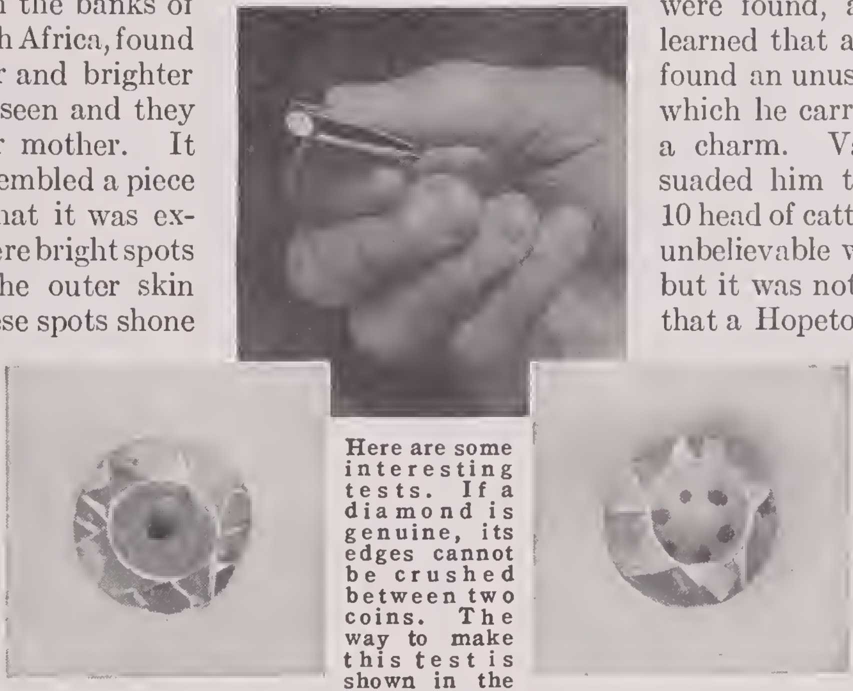
As soon as the news of this victory reached America, President McKinley appointed Dewey a rear-admiral, and before his return to the United States in 1899 he had been made admiral, a rank which had been conferred before only upon Farragut and Porter. It was also voted that Dewey should never be placed on the retired list of the navy; so that he was still considered in active service at the time of his death (Jan. 16, 1917), although he was then 80 years old. A house in Washington was purchased for Admiral Dewey by popular subscription. Although there was later some reaction from the hysterical worship which at first greeted his exploit, he enjoyed to the end of his days a well-earned popularity.

The SPARKLING CRYSTAL COUSINS *of* COAL

How the Great Diamond Industry of South Africa Grew out of a Child's Discovery—Why Diamonds are so Precious—Glittering Pebbles with Famous Names and Strange Histories

DIAMOND. One day some Boer children, playing on the banks of the Orange River in South Africa, found a pebble that was larger and brighter than any they had ever seen and they ran to show it to their mother. It was nearly white and resembled a piece of lump alum, except that it was extremely heavy. There were bright spots on the surface where the outer skin was rubbed thin and these spots shone as though there were a hidden light within. A few days later they showed it to a neighbor named Van Niekirk. He offered to buy it, but the children laughed at the idea and told him to "sell it and make his fortune."

IS IT A REAL DIAMOND?



Here are some interesting tests. If a diamond is genuine, its edges cannot be crushed between two coins. The way to make this test is shown in the middle picture above. This is because the diamond is the hardest known material in nature. Another test is to look at a black spot on a white card through a diamond, about a quarter of an inch away. If the gem is real, the spot is plainly seen, as in the picture to the left. If the stone is false, the spot appears as a ring of spots, as shown on the right.

Van Niekirk took the stone to storekeepers in the towns near by, but they would not believe it was valuable. "It is a very pretty pebble," they said, "but who will pay money for it?" Finally he gave it to a trader to sell for him. The trader sent it to a government agent, who said it was a diamond weighing 21 carats. Most of the diamonds we see in rings are from one-half to one carat in weight, so you can see that a 21-carat diamond is very large and valuable. The governor of the colony paid $2,500 for it, and sent it to the Paris Exhibition of 1867.

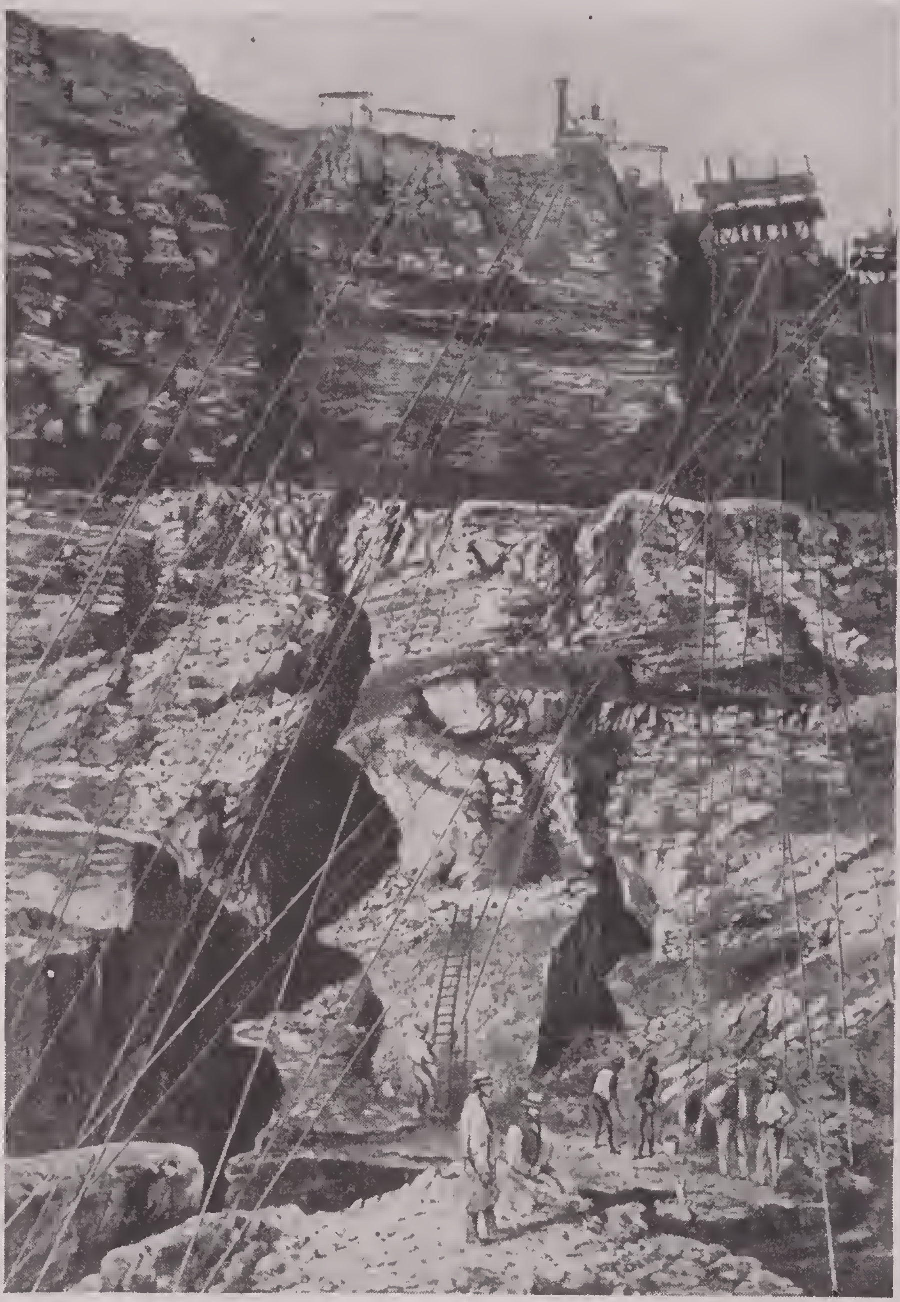
People generally did not believe there were many diamonds in Africa. But Van Niekirk kept his ears open for stories of strange stones that were found, and two years later he learned that a poor shepherd boy had found an unusually large bright stone, which he carried around with him as a charm. Van Niekirk finally persuaded him to sell it for 500 sheep, 10 head of cattle, and a horse. This was unbelievable wealth for the poor boy, but it was not a tenth of the $56,000 that a Hopetown firm paid for it. It was a diamond of 83½ carats uncut and is now known as the Dudley diamond.

When these finds became known there was great excitement not only in South Africa but all over the world, and diamond hunters came from every corner of the globe. One great diamond field after another was brought to light, and the mines were found to be the richest in the world. Today the South African mines produce 90 per cent of the world's supply. Among the most valuable are the Kimberley-De Beers mine, the great Premier mine, and the new Jagersfontein mine.

India and Brazil supply a large part of the remainder of commercial diamonds, although diamonds in small quantities are found in Borneo, British and Dutch Guiana, Australia, Sumatra, China, and the United States. Pike County, Arkansas, has furnished most of the diamonds found in the United States. More than 2,000 stones have been found there, one of over 16 carats. Diamonds have also been found in other localities—in California, North Carolina, Virginia, Ohio, Wisconsin, and Indiana.

The diamond has long excelled all other precious stones in interest and importance. It is harder than any other substance and this excessive hardness gives it its name, which is from the Greek word *adamas*, meaning "the unconquerable." The diamond itself is usually colorless. It takes its place at the head of the precious stones because of the marvelous "fire" which flashes in every color from brilliant blue to glowing red with every movement. Other colorless stones like white sapphire, topaz, and rock crystal, reflect light brilliantly, but do not glow and sparkle like the diamond. Sometimes diamonds are tinged with yellow, pink, red, orange, green, blue, brown, or black. Blue, red, and green are exceedingly rare colors and add to the value of the stone. Some bluish-white diamonds are phosphorescent in the dark after exposure for a time to sunlight.

DIAMOND-MINING IN THE OLD DAYS



Before the shaft and tunnel system of mining, shown on the next page, was adopted, a diamond mine in South Africa looked as if some giant spider had been spinning his web across it. A maze of wire ropes, which led to windlasses around the edge of the mine, hauled up the buckets of "blue ground" or diamond-bearing rock. At one time more than 3,000 claims were being worked in the famous Kimberley field within an area of 1½ square miles.

For many centuries the diamond mines of India were the chief source of the world's supply, and some of the most beautiful and famous stones have come from that country. The Greeks, returning home after the invasion of India in 327 B.C., probably brought the first knowledge of the precious gem to Europe. The diamond was held in awesome reverence, for it was supposed to have magical powers, being able to cure sickness and to bring good or ill fortune to its possessor.

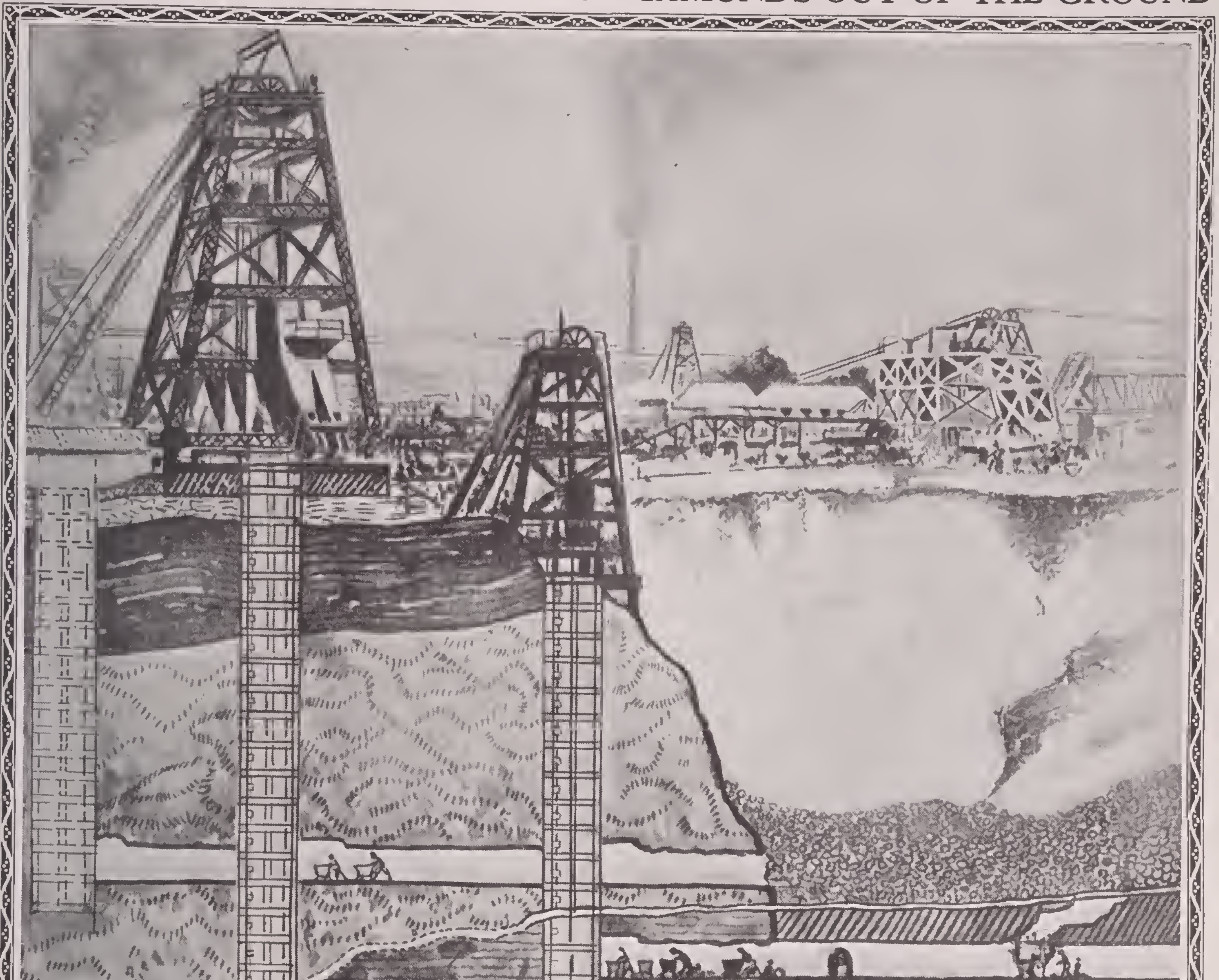
Scientists tell us that the diamond is crystallized carbon. And what is carbon? It is one of the most common materials in nature, one that exists not only in vast amounts in the earth but in trees and plants of every kind. At some time in the earth's history this carbon was changed to liquid by great heat and crystallized under enormous pressure, and in crystallizing, it changed from its black and uninviting appearance to the most beautiful precious stone we have. So, for all its great beauty, the diamond is a close relative to our common coal.

Many attempts have been made to manufacture diamonds artificially. In the most successful of these, pure carbon made from sugar was dissolved in molten iron in an electric furnace heated to 5500° F. After a few minutes in this terrific heat the molten mass was cooled suddenly. This solidified the outer layer of the iron, holding the inner molten mass in a tight grip. The expansion of the inner liquid as it cooled and hardened produced an enormous pressure on the dissolved carbon and it crystallized into tiny eight-sided diamonds. This experiment, first made by the French chemist Moissan, has been repeated several times, but the largest stone produced could be examined only under a microscope.

Besides its value as a gem, the diamond is of great use in the arts and manufactures because of its hardness. Diamond dust is used for polishing diamonds and other gems, and the natural edge of a diamond is used for cutting and engraving glass, and for other purposes. Inferior diamonds are also used as edges for rock-boring tools.

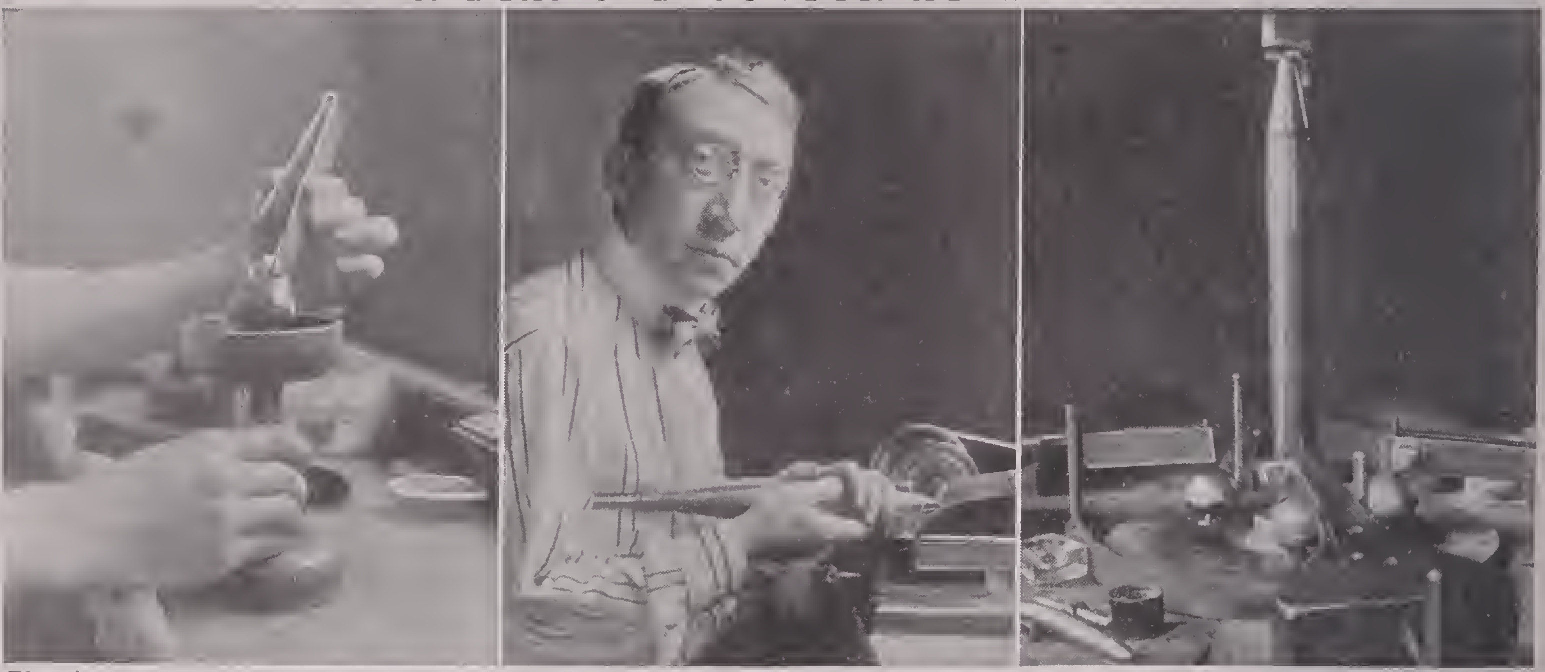
Before being used as jewels diamonds must be "cut." This is done by means of diamond dust applied with oil on a rapidly revolving metal plate. This takes off the rough coat and leaves a brilliant polish. The "brilliant" pattern has 58 highly polished facets, 33 above and 25 below the band around the stone at

THE MODERN WAY OF GETTING DIAMONDS OUT OF THE GROUND



If we could slice a big modern South African diamond mine in two as one splits an apple, it would look like this. You would see a lot of Kaffirs with picks digging out the "blue ground," and others hauling it in trucks to the shaft, where it is tipped into elevator cars called skips. These skips are then hoisted to the surface. There the rock is spread out to weather for several months. When it has crumbled to bits, the diamonds are separated by washing the mass down a sloping table of corrugated iron smeared with grease. The diamonds stick to the grease and the other minerals are washed away.

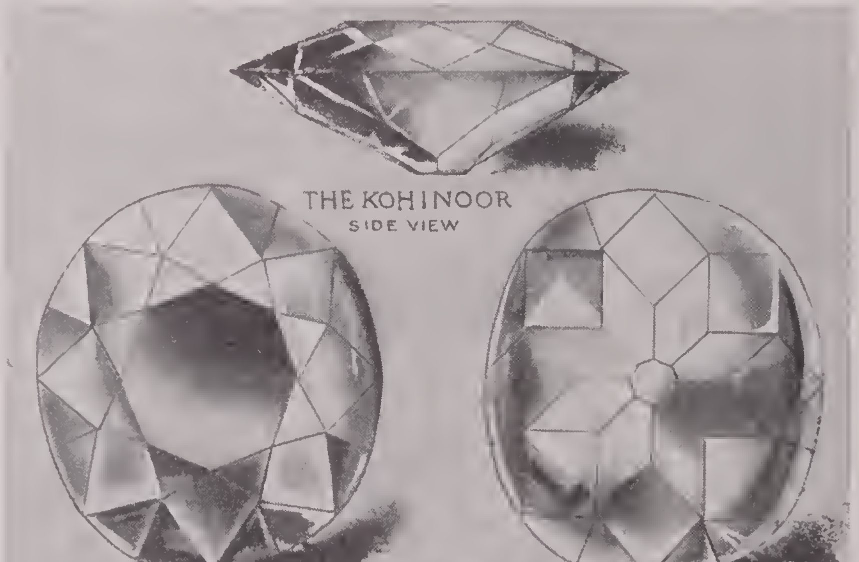
A DIAMOND CUTTER AT WORK



The picture on the left shows the diamond cutter's hands shaping the soft solder in which the diamond is mounted so that it may be held firmly while he is polishing it. The second picture shows the preliminary hand polishing. Three of the soft solder mounts (the small round balls) are shown in the last picture, where the diamonds are being held by clamps against a horizontal emery wheel which is revolving at the rate of 3,000 revolutions per minute. A wet mixture containing diamond dust is applied to the wheel from time to time. It is a case of "diamond cut diamond," as the saying goes.

the widest point. The object of this cutting is to obtain as nearly as possible a total reflection of all the light that falls on the stone. About 98 per cent of the diamonds today are brilliant cut. The "rose" pattern was formerly a favorite, but when cut in this way the diamond has little fire. Until about 30 years ago, Amsterdam in Holland was the diamond-cutting center of the world; but the finest cutting is also done in the United States today, and to a large extent with machinery. About 60 per cent of the weight of rough diamonds is lost in the cutting and polishing process.

OLD AND NEW STYLES IN DIAMONDS



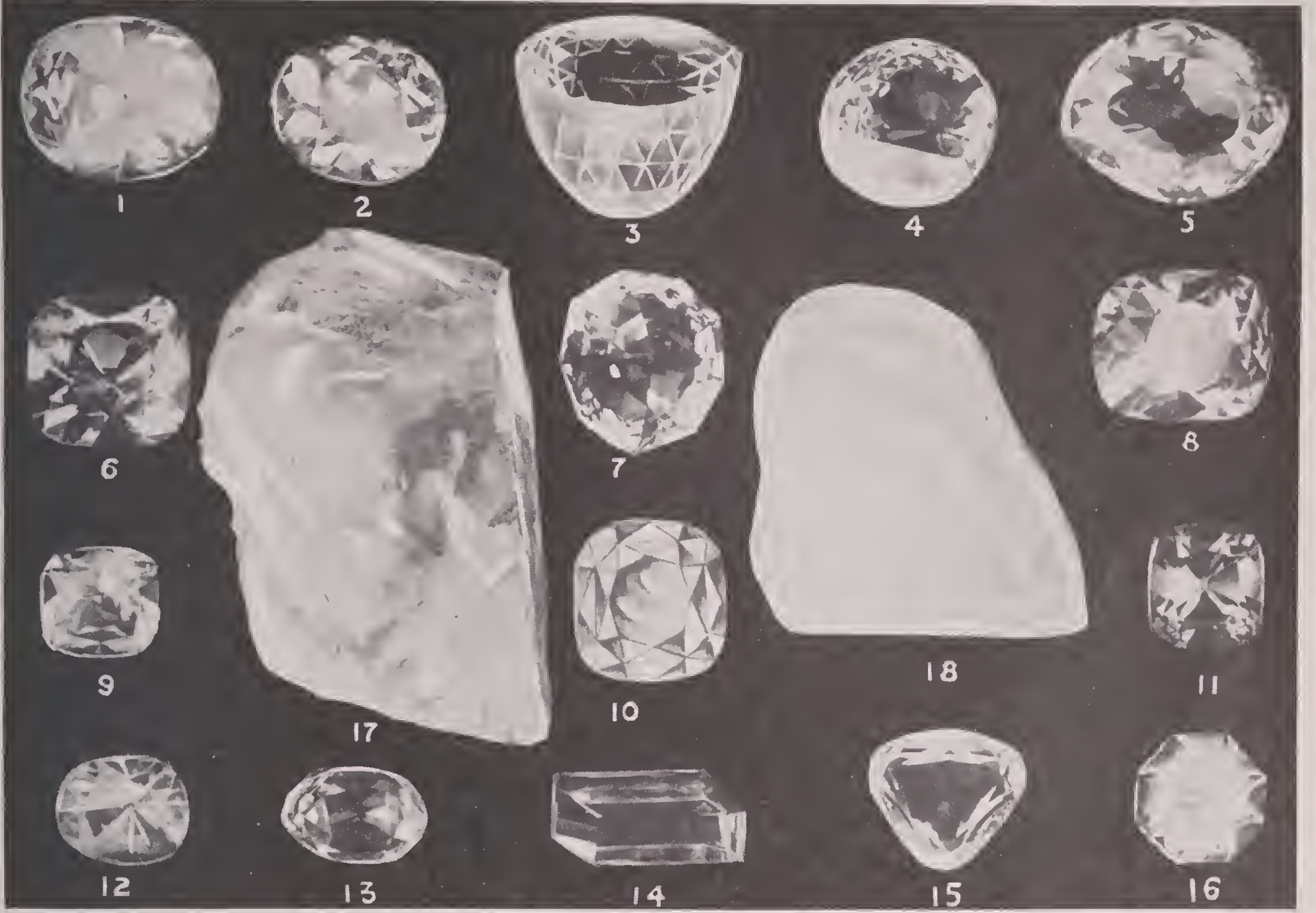
The lowest of these four sketches shows the shape of the famous Kohinoor diamond as it was first cut, following the old style. The other pictures show how it was trimmed into its modern form. This seems like a dreadful waste of precious material, but don't you see how, with those broader facets, it must flash back the light much more brilliantly?

Diamonds weighing more than 100 carats are very few, and many of these great gems have played an important and romantic part in history. The most noted historic diamond is the Kohinoor of the English crown jewels. There is a tradition that this beautiful gem was taken in 1304 from a rajah at Malwa, in whose family it had been an heirloom for centuries. It is believed to have been guarded with other treasures at Delhi until 1739, when it was carried off by the Persian Nadir Shah as part of his immense plunder. Finally it was surrendered to the East India Company, whose directors presented it to Queen Victoria. Its weight in its Indian cutting was 186 carats, but after recutting in London in 1852 the weight was reduced to 106 carats, although it gained immensely in brilliancy.

The "Great Mogul" was the largest Indian cut diamond of which there is any record. It weighed 817 carats in the rough, but was reduced to 287½ carats by the unskilled cutting of a Venetian lapidary. It was seen by the French gem-dealer Tavernier in Delhi, in 1666, and is believed to have later formed part of Nadir Shah's booty. There has been no definite notice of it since Tavernier's time, so this great diamond must either have been lost or cut up into smaller stones.

The "Orlof" was one of the Russian crown jewels. One of the many strange tales that have been told of it is that it formed one of the eyes of an idol in a Hindu temple, and was stolen by a French grenadier. After passing through many hands, it came into the possession of an Armenian merchant, who sold it for $560,000 and a patent of nobility to Count

SOME OF THE WORLD'S FAMOUS DIAMONDS



If you had just one of the precious stones here shown, you wouldn't need to worry about money, for it would make you independent for life. They are: the Kohinoor after its second cutting, 106 carats (1), after first cutting, 186 carats (5); Loterie d'Angleterre (2); Great Mogul, 287½ carats (3); Orlof, 199¾ carats (4); Regent, 140 carats (6); Duc de Toscane (7); Star of South, 125 carats (8); Polar Star, 40 carats (9); Tiffany, after cutting, 125½ carats (10), before cutting, 287½ carats (18); Blue Diamond d'Angleterre (11); Sancy, 53¾ carats (12); Empress Eugenie, 51 carats (13); Scheik (14); Massuk (15); Pasha, 40 carats (16); Great Premier, before cutting (17).

Orlof, who gave it to the Czarina Catharine II. It weighs 199.73 carats.

One of the most celebrated diamonds in the world is the "Regent" or "Pitt" diamond. It is considered matchless in brilliancy and proportion. The rough diamond, as it was found in India, weighed 422 carats, but the cutting reduced it to 140 carats. One story is that it was stolen by a slave in the diamond mines who escaped to the coast and sold it to a shipowner for $26,000 and a passage to England. It was purchased by Pitt, governor of Madras, and later sold to the Duke of Orleans, regent of France, and became part of the crown jewels of France.

A celebrated diamond belongs to the Rajah of Mattan, in Borneo. It was found on that island, is pear shaped, and weighs 318 carats. The people of Borneo believe that water in which this stone is dipped will cure all diseases.

"The Star of the South" is a great diamond found in 1853 in Brazil by a poor negress. It weighed in the rough 257½ carats. It is of great beauty and rose tinted.

But all other diamonds were outrivaled by the great Cullinan crystal which was found in the Premier mine in the Transvaal in 1905. It weighed in the rough 3,106 carats (1⅓ lbs.) and was about the size of a man's fist. It was presented to King Edward VII by the Union of South Africa, and the following year was cut into nine large stones and a number of small brilliants. The largest, "The Star of South Africa," outranks all other brilliants, weighing 530 carats. It is flawless and of great beauty. The "Lesser Star of South Africa" is second among the world's diamonds, and weighs 317 carats.

DIANA. A Roman divinity who was later identified with the Greek goddess Artemis. She was represented as the twin sister of Apollo, and was the moon-goddess as Apollo was the sun-god. Many stories show her also as a chaste huntress. (*See* Artemis.)

DIAPHRAGM (*dī'ȧ-frăm*). Next to the heart, the diaphragm is perhaps the most important muscle in the body. It is a dome-shaped membrane, extending across the body below the chest cavity and separating the lungs and heart from the abdomen. Its edge follows the general outlines of the lower ribs, being fastened to the breastbone in front. When the diaphragm straightens out and compresses downward, it sucks air into the lungs. It is thus the principal muscle of respiration. The muscles between the ribs are also used as respiratory muscles.

What is called "diaphragm breathing"—that is, using the diaphragm almost entirely and leaving the upper ribs of the chest extended in a stationary position—is used by singers in obtaining great volume and control of the voice. For ordinary purposes both rib and diaphragm breathing should be cultivated. Anything which restricts breathing, such as tight clothing or lacing, should be avoided.

DIAZ (*dē′äs*), PORFIRIO. In her history as an independent nation, Mexico has enjoyed approximately 30 years of unbroken peace and prosperity—and this respite she owed to her "iron man," Porfirio Diaz.

Of mixed Spanish and Indian blood, Diaz was born Sept. 15, 1839, in the midst of civil wars after his country had thrown off the yoke of Spain. At 17 he walked 250 miles from his native Oaxaca to fight for his country against the Americans. Later he fought Santa Anna and the French puppet ruler Maximilian. On the reëlection of Juarez as president in 1871 Diaz led a new revolution which culminated victoriously in 1877 with his installation as president. Except for the years 1880-84, when he was out of office owing to a provision forbidding reëlection, Diaz was practically dictator until 1891.

Under Diaz Mexico found itself at peace for the first time in 60 years. He ruled benevolently, but with an iron hand and developed the resources of Mexico to a marvelous degree.

Early in 1911 Francisco I. Madero led a successful revolt and Diaz resigned. He spent the remainder of his life in Europe, dying on July 2, 1915, heartbroken, his friends said, at the woes of his country.

CHARLES DICKENS *and His Story People*

DICKENS, CHARLES (1812–1870). You can learn a good deal about the life of this celebrated English novelist by reading his books, for he drew freely upon his own experiences for the characters and backgrounds of his stories. 'David Copperfield' is largely autobiographical; "Mr. Micawber" was his father, and "Mrs. Nickleby" (in 'Nicholas Nickleby') his mother. Many of his queer characters he met while working at menial tasks, or when visiting his father in the debtor's prison. And the poverty-stricken and criminal quarters which form the setting of many of his stories were all too familiar to Dickens' wretched childhood.

His father, John Dickens, was a clerk in the navy pay office at Portsmouth, England, on a salary of $400 a year, at the time Charles was born in the shabby waterside suburb of Landport; but two years later he drifted aimlessly to London to better his fortunes. An impractical optimist, like "Mr. Micawber," he was always confidently expecting something to "turn up," and so went steadily down in the world. While he was in a debtor's prison his family lived in a back attic of the London slums.

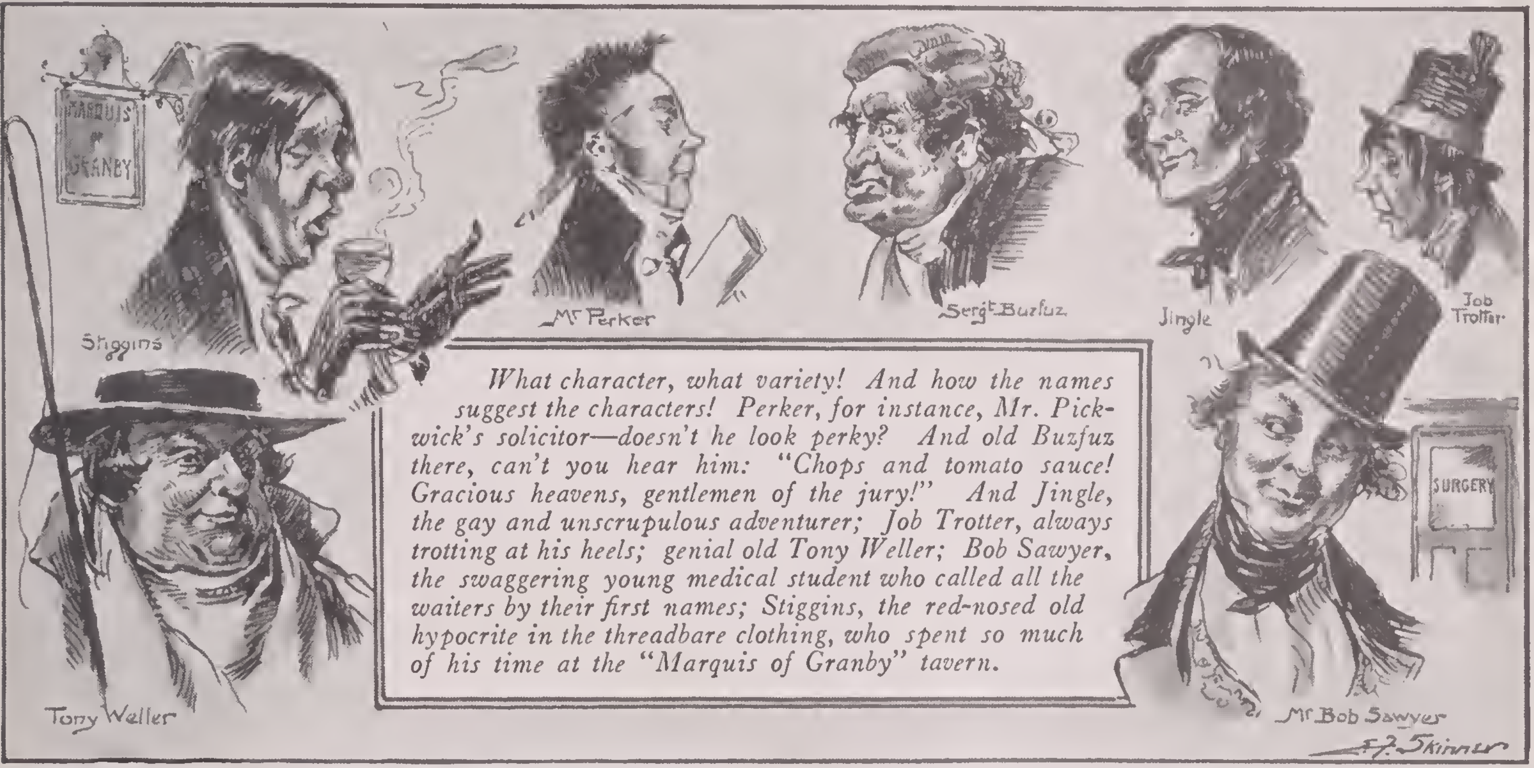
An odd, sickly, sensitive little fellow, whom his father at least knew to be a prodigy, Charles grew up with a sense of neglect and wasted talents, and in bitter humiliation. His mother taught him to read, he had a few of the best books of imaginative literature, and during a few years of comparative prosperity he was sent to school. At 16, however, the family fortunes were at so low an ebb that he was put to work in a blacking factory. Pride, despair, and burning ambition drove him to spend all his leisure hours in study in the British Museum.

Thus, at 19, he climbed up to doing hack reporting for a London newspaper. At 24 he published his 'Sketches by Boz', and a year later 'The Pickwick Papers' brought him fame and put him on the road to fortune. The rest of his life was an unbroken record of success as a novelist, short-story writer, magazine editor, public entertainer, and social lion. In 1842, and again in 1867, he visited the United States, where his writings were as popular as in England, in order to give dramatic readings from his own works.

Most of the characters in the novels of Charles Dickens stand out clear and sharp, not so much like living people as like living cartoons. A man becomes simply his most obvious virtue or fault, enlarged and illustrated. Some of his characters are ludicrous or grotesque, some pathetic or lovable; but there is not one who fades into the background of his surroundings for lack of clever, sharp pen-drawing. An observant reporter of life, not a smell or taste, a sight or sound, that could add to his word-pictures ever escaped Dickens. You may perhaps find him a little long-drawn-out and hard to read at first, because his fancy is so exuberant and discursive. He runs into delightful little side-paths of description that have nothing to do with the story. But there is a big human story in every one of his books, and every one is filled with the most surprising and original people. His works brought about reforms in English courts, schools, and prisons, and have moved three generations of readers to laughter and to tears. His admirers cheerfully admit his literary sins—his sentimentality and showman's tricks of style—and continue to read him with candid delight.

Dickens' chief works are: 'The Pickwick Papers' (1837); 'Oliver Twist' (1838); 'Nicholas Nickleby' (1838–39); 'Old Curiosity Shop' (1840); 'Barnaby Rudge' (1841); 'American Notes' (1842); 'Martin Chuzzlewit' (1843); 'A Christmas Carol', 'The Chimes', and 'The Cricket on the Hearth' (1843–48); 'Dombey and Son' (1846–48); 'David Copperfield' (1849–50); 'Bleak House' (1852–53); 'Hard Times' (1854); 'Little Dorrit' (1855–56); 'A Tale of Two Cities' (1859); 'Great Expectations' (1860); 'Our Mutual Friend' (1864–65); and 'A Child's History of England' (1853). 'The Mystery of Edwin Drood' he left unfinished.

Mr. Pickwick and the Pickwick People



What character, what variety! And how the names suggest the characters! Perker, for instance, Mr. Pickwick's solicitor—doesn't he look perky? And old Buzfuz there, can't you hear him: "Chops and tomato sauce! Gracious heavens, gentlemen of the jury!" And Jingle, the gay and unscrupulous adventurer; Job Trotter, always trotting at his heels; genial old Tony Weller; Bob Sawyer, the swaggering young medical student who called all the waiters by their first names; Stiggins, the red-nosed old hypocrite in the threadbare clothing, who spent so much of his time at the "Marquis of Granby" tavern.

MR. PICKWICK was a stout elderly English gentleman, who lived in lodgings in that London which Charles Dickens loved to describe. A bachelor with a good income, he was very neat in his dress. He always wore the tightest of breeches, and gaiters like a lady's shoe-tops were buttoned snugly up to the calves of his legs. He was bald, and through the largest and roundest of spectacles his eyes twinkled and beamed on the world.

Everyone who knew Mr. Pickwick loved him for his kind heart and pleasant manners. They admired and respected him, too, for he was supposed to be a man of learning. He had written a paper on the ponds of Hampstead Heath, and on the habits of the tittleback, or stickleback, a tiny nest-building fish that lived in them. Really, you know, Mr. Pickwick was just a dear old goose of a man, but he was as simple and as busy about things that amused him as a child.

Mr. Pickwick thought he had a great mind, and that he ought to use it for the public benefit. There were thousands of people in London who had never been outside of it, and all they knew of the country and towns around it was what they read in the newspapers. Mr. Pickwick felt that it was his duty to face all the perils of travel and investigate matters of scientific interest in other parts of England. As he liked good company he invited three of his friends to form the Pickwick Club and join him in his journeys.

He made a speech about it. With one hand under his coat tails and the other waving in the air, Mr. Pickwick said there would be fame enough for all. He would make reports to learned societies. Mr. Tracy Tupman, who was fond of the ladies, could make a record of the times he lost his heart. Mr. Snodgrass, a romantic gentleman in a Roman-looking cloak, had always yearned to write poetry. He could put the beauties of rural England into verses that would never die. And Mr. Winkle, who had a taste for outdoor sports, could wear perfectly gorgeous hunting clothes, and win fame as a sportsman.

Mr. Pickwick's Remarkable Friends

Now all of these gentlemen were just as simple as Mr. Pickwick. Every time Mr. Tupham lost his heart and made love to a lady, he got into trouble with her family or with a jealous rival. Mr. Snodgrass had the most poetic thoughts, but he never wrote any poetry. It was so dangerous to others for Mr. Winkle to carry a gun that he never learned to shoot. And Mr. Pickwick filled books with foolish notes, but couldn't make head or tail of them, so he had nothing to report.

But all that is what makes the fun. The members of the Pickwick Club were as guileless as the babes in the wood, so they got themselves into the most ridiculous scrapes. They met the oddest people on their travels, had the funniest adventures, and heard the strangest stories and believed every word of them. Sam Weller made a good deal of the fun. He was Mr. Pickwick's bright, impudent, talkative man-servant. There was Mrs. Bardell, the sentimental landlady, who through a very natural mistake got Mr. Pickwick sent to Fleet Street prison. And there was Mrs. Leo Hunter, who collected social lions; and that attractive scamp, Mr. Alfred Jingle, who put Mr. Tupham in the shade as a lover; and the fat boy Joe, who did nothing but eat and sleep.

At a cricket match the travelers met the Wardle family of the Manor Farm—father, two pretty daughters, a maiden aunt, the deaf and cross-grained old grandmother, and the fat boy Joe, who was Mr. Wardle's fairly useless young servant. They all lunched together, and struck up such a friendship that the whole Pickwick Club was invited to spend the Christmas holidays at Manor Farm.

Two days before Christmas they left London by the Muggleton stagecoach. It was a frosty morning. As they climbed inside and wrapped their traveling cloaks around their legs, and their shawls around their noses, they learned just what a serious risk they were taking. Sam Weller's father—whose frequent advice to his son was, "Samuel, beware of vidders"—was the coachman.

"Werry bad road this, sirs," he said. "Nasty bit along the canal. But I'm a uncommon good whip, an' can do wot I like with my 'orses. Once I had a accident an' spilled a coachload o' fine gentlemen in the canal."

"Very extraordinary!" said Mr. Pickwick, whipping out his notebook.

"Not so werry. Parliamentary election on in Muggleton. I got 20 pounds for that job. None o' the party 'urt, sir. Just laid up a bit over the election."

Nothing happened on that trip. At three o'clock in the afternoon they got off at the Blue Lion Inn, in Dingley Dell. They found Joe the fat boy fast asleep by the bar-room fire. When he was waked up he said he had a cart for the luggage, with room for Mr. Pickwick's servant. Mr. Wardle thought the gentlemen would like to walk across the fields.

"Capital idea," said Mr. Pickwick. "Here, Sam, you help Joe."

Sam began to stow the bags and valises into the cart. The fat boy stood by watching him work with the deepest interest.

"Well, young 20 stone (280 pounds' weight), you're a prize boy, you are. You aint got nothin' on your mind to fret you, have you?"

"Not as I knows on," said the fat boy. "Can you drive, Mr. Weller?" As Mr. Weller could, and did, the fat boy curled up in the cart and went to sleep.

The Gaieties at Manor Farm

Many gay young people were guests at the Manor Farm, for there was to be the Christmas wedding of Miss Emily Wardle. They all raced across the frosty fields to meet the gentlemen from London at the stile in the hedge. And oh, what a hearty welcome from everyone! Mr. Wardle was the finest of hosts. The servants grinned with pleasure, and fairly flew around, and the deaf old grandmother forgot to be cross when the beaming Mr. Pickwick appeared. He was a favorite in every society, and now he was so full of the spirit of Merry Christmas that he looked like a fairy Puck, or a neat and pompous sort of Santa Claus. In a moment he was chucking the bride under the chin, and proposing to dance a minuet with the grandmother. After a country supper, card-playing, and dancing, there was sound sleep in warm feather beds, pleasant dreams, and a white snow-covered country to wake up in.

After the wedding in the ivy-clad village church, they all trooped back to the manor to a noon breakfast. Sam Weller waited on the table in London style to the great joy of the fat boy.

"Joe!" shouted Mr. Wardle. "Confound that boy, he's gone to sleep again."

"No I ain't, sir." Joe looked injured. Go to sleep when there was such a feast! He had been eating Christmas pie!

Mr. Pickwick proposed the health of the bride and groom—"God bless 'em!" It was drunk with cheers and tears, and the fat boy burst into such a loud blubbering that Sam Weller led him out by the collar.

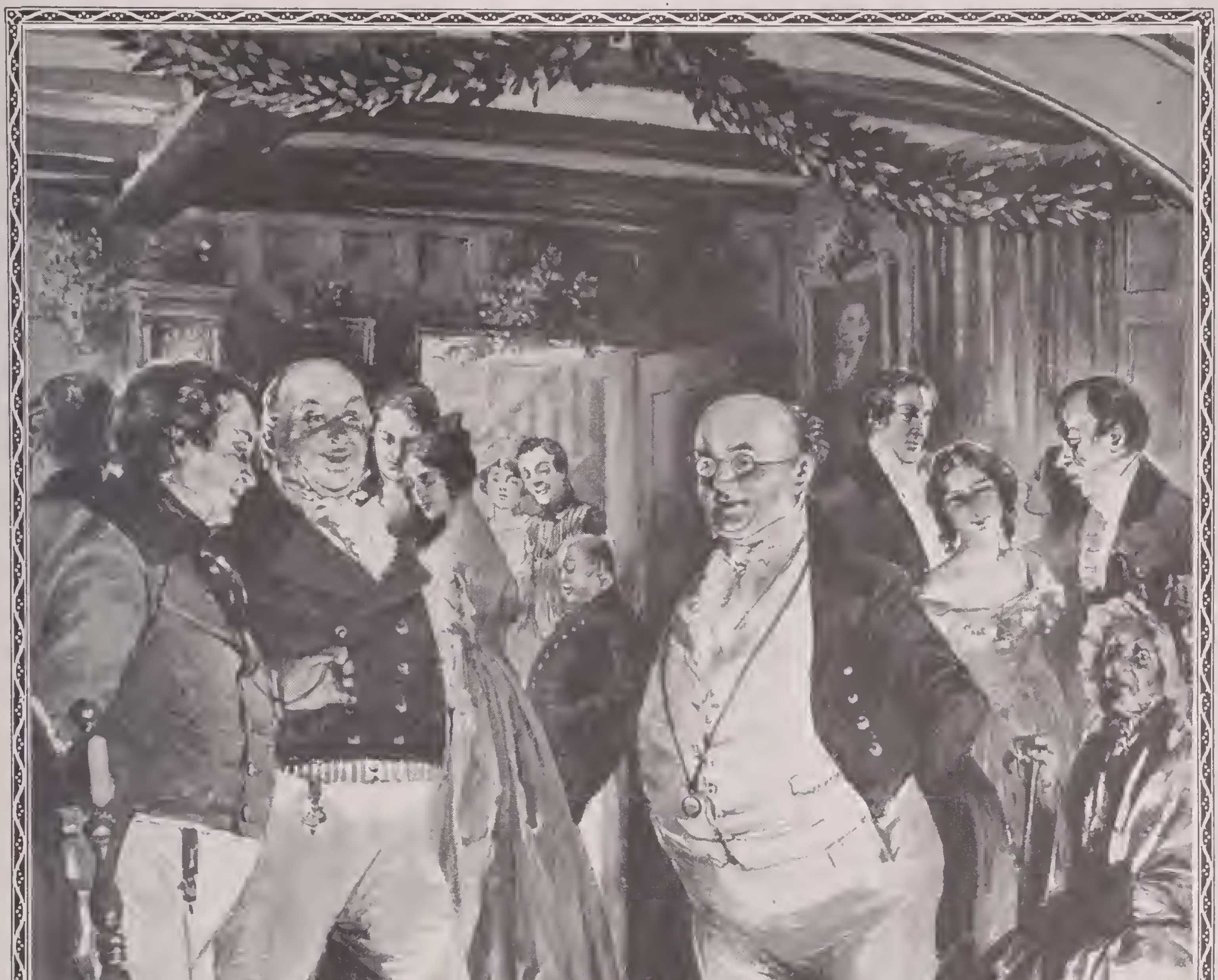
After the wedding feast the house party walked over the sparkling country, 25 good miles. That was to give them an appetite for as hearty a dinner. Then, with the carpets up in the big hall and sitting room, the fire roaring up the chimney, and the candles burning bright, they began the Christmas Eve country dance. For the first and last time in the story Mr. Pickwick wore silk stockings and dancing pumps.

"You in silk stockings?" cried the shocked Mr. Tupham.

"Why not, sir?—why not?" Mr. Pickwick was a little warm, not to say heated.

Mr. Tupham really couldn't say why not, so he didn't.

CHRISTMAS WITH THE PICKWICKIANS AT DINGLEY DELL



There he is, the dear old gentleman, with his hands under his coat tails, as usual. And, of course, you know who that is asleep in the doorway—the Fat Boy. And beyond is Sam Weller, who is laughing at him. Beside Sam is the pretty chambermaid. The first gentleman on the left, gracefully toying with his monocle, is Mr. Tupman, who was so fond of the ladies—always losing his heart; next to him the genial host, Mr. Wardle; then comes Mr. Trundle and Bella Wardle. Just back of Mr. Pickwick are Mr. Snodgrass and Arabella Allen, and on Miss Allen's left, Mr. Winkle. The Grandmother, the dearly loved tyrant of the household, is seated there with her cane.

Mr. Pickwick led the delighted grandmother to the end of the room. Then the fiddles and harp struck up, and all the dancers saluted their partners, and were off on a merry frolic. No one was happier than Sam Weller, who had a pretty housemaid for a partner,—unless it was the fat boy.

"Don't my master breed nice porkers for pie, though!" he said with his mouth full.

"I'll tell you what it is, young boa constrictor, you got to eat and sleep less and exercise more, or you'll come to a bad end," warned Sam. "You're werry near bustin', right now."

When Mr. Wardle hung a branch of mistletoe from the raftered ceiling, Mr. Pickwick led the grandmother under it, and kissed her with the most respectful gallantry.

"Oh the darling old dear!" cried one of the young ladies. She flung her pretty arms around Mr. Pickwick's neck and kissed him on the cheek. The others followed, and he was fairly smothered.

"This," he said, beaming on all of them, "this is indeed home comfort."

There was more kissing and laughing, then blind man's bluff, forfeits, snapdragon, and other old English games; then drinking from the wassail bowl, and the telling of goblin stories, with the wind whoo-whooing in the chimney, until the clock struck twelve. After that they sang carols to welcome the Christmas morning. It was snowing in thick white clouds, and drifts were piling up along the hedges, when they took their candles and trooped merrily away to bed calling back:

"Merry Christmas! Merry Christmas!"

We are going to stop right here. As Sam Weller said when he wrote a letter to his sweetheart: "The whole art o' letter writin' is to pull up sudden so she'll vish there vas more."

Besides, you can read all about that Merry Christmas, and other happenings, in the 'Pickwick Papers'.

—Adapted from Charles Dickens' 'Pickwick Papers'.

DICTAPHONE. An adaptation of the phonograph used in many business houses to take dictation. The dictation is spoken through a tube and recorded on a revolving wax cylinder. This record is then put on a transcribing machine, which repeats the letter or message, while a typist writes it on a typewriter. (*See* Phonograph.)

DICTOGRAPH. In detective work criminals are often trapped by the dictograph, which is a modification of the telephone, with a highly sensitive transmitter and a large diaphragm to increase the reproduction of the sound at the receiving end. The transmitter is hidden where its presence will not be suspected and connected with a receiver in a recording station, where the words are taken down by a stenographer. Another form of the dictograph is used in railroad stations in larger cities. The train announcer speaks into the transmitter and his words are repeated through receivers with megaphone attachments in different parts of the station. Some large hotels and hospitals also use this device to "page" their guests or physicians. (*See* Telephone.)

DIGESTION. If we want a steam engine to run and furnish us with power, we must see that it is fed the proper fuel. If we fail to stoke it and keep the firebox properly cleaned of its waste, the boiler soon grows cold and the engine stops. We must remember that the human body also is a machine which is constantly working and using up force, and this must be continually renewed.

Any substance which will repair the waste of the body and provide the raw material for growth is a food, though its form and condition may have to be entirely changed before it can be used. This process of changing various materials into a form that can be absorbed by the tissue cells is known as the process of digestion. In general our foods consist of complex large molecules. They must be split into smaller and simpler particles before they can be absorbed. Man has a special set of organs whose business it is to do this work and nothing else. These organs form the digestive tract. (*See* illustration under Physiology.)

The tissue cells or living units of which the human body is made require five classes of foods—proteins, carbohydrates, fats, mineral salts and water, and vitamins(*see* Food; Vitamins). There are two methods of preparing these foods for use by the individual tissue cells. One method is a mechanical one, like chewing; the other is chemical, like the changing of starch into sugar. This chemical action is accomplished by means of certain fluids found in each of the digestive organs. In the mouth this fluid is alkaline and is known as "saliva"; in the stomach it is acid and is called "gastric juice." Into the intestines are poured three distinct fluids,—the "intestinal juice," the "bile," and the "pancreatic juice." The bile is made by the liver (*see* Liver). The pancreatic juice is made by the pancreas, a gland some seven inches long which lies behind and below the stomach (*see* Gland).

The Little Helpers in the Food Factory

These digestive fluids have in them certain ferments called "enzymes," which may well be called "helpers" of digestion. Each digestive fluid has its own particular set of "helpers," usually two or more; and if these are absent from any cause whatever, the work of that fluid is seriously hindered if not stopped.

In the mouth the saliva has two enzymes or "helpers"—"ptyalin" and "maltase"; these help to change the starch into sugar. In the gastric juice of the stomach the helpers are "pepsin" and "rennin," which act upon the proteins (eggs, meat, and the like) changing them into peptones. The pancreatic juice has several helpers—"amylopsin" (which finishes the digestion of starches), "trypsin" (which continues the work on proteins), and "steapsin" (which splits up the fats). These are the principal enzymes, but there are a dozen or more of these helpers in all. The enzymes never meddle with each other's work. For example, the ptyalin and maltase of the saliva work very rapidly in changing the starch into sugar, but they pay no attention whatever to the meats or eggs. And the enzymes of the gastric juice act on the meats and eggs, while they ignore the starches.

Bearing in mind these two methods of preparation (the mechanical and the chemical), as well as the five great classes of foods, let us take an ordinary dinner of milk, fruit, meat, and vegetables, and follow it on its way to the tissue cells.

In the first place the food enters the mouth; here it is thoroughly masticated or crushed by the teeth (if we are not too lazy) and mixed with the saliva. The saliva softens the entire mass so that it may be tasted and swallowed; it also changes some of the starch in the bread and vegetables (potatoes, perhaps) into sugar. But this work it does not complete, because the food does not stay in the mouth long enough.

Chemistry and Machinery of the Food Factory

The entire softened mass is now passed on through the oesophagus or "gullet" to the stomach. The mechanical process here is a peculiar one. The muscular walls enable the stomach to move this food mass with a churning movement known as the "peristaltic" motion. This again thoroughly mixes the food mass with the gastric juice which is secreted in the stomach. This juice is acid and contains both pepsin and rennin. The acid softens the connective tissue of the meat and the fibers of the vegetables, and prepares them for the action of the pepsin. The rennin acts upon a protein (casein) of milk, changing it to another protein called "curd." Then the pepsin changes proteins, including the curd, into peptones. The saliva continues its action on the starches, but soon stops because it cannot act in the presence of the acid. The fats are freed from connective tissue and float as little globules.

This food mass which now occupies the stomach has become a rather thick yellowish fluid, called "chyme." A small portion of the water and dissolved salts is taken up by the blood vessels of the stomach; but the bulk of the chyme passes on gradually into the intestines. Here the process of digestion is continued. The intestines are about 30 feet long and the mechanical movement is a continuation of that of the stomach. The chemical process continues, completing the digestion of the proteins, sugars, starch, and fats. The intestinal fluid is a mixture of the intestinal juice, pancreatic juice, and the bile. The pancreatic juice (alkaline) finishes the work on the proteins of the meats and vegetables, which was begun in the stomach; and it also finishes the change of the starch into sugar. The fats are split up into fatty acids and glycerin. Soaps are also made here and used to "emulsify" or divide the fats into small particles that they may be absorbed. The indigestible waste, of which there must always be a considerable amount, is carried into the large intestine and eliminated.

Thus we see that the proteins in our meat and vegetables were partly digested in the stomach and finished in the intestines; the sugar and starch in our fruit and potatoes were prepared in the mouth and intestines; the work on the fats is finished in the intestines. The salts and water need no digestion, and we have not yet learned anything about the chemistry of vitamins.

This dinner, which was presented to us largely in the solid form, has been transformed by the process of digestion into a liquid ready to be taken up by the blood-vessels of the intestines. Much of it goes to the liver and may be stored there or changed. Eventually all food is carried to the heart. From here it is distributed all over the body by the areries.

Control of Our Food Factory

These organs of digestion are largely under the control of nerves. For example, the mere thought of food will cause the juices to start to flow, and we all know the "dry mouth" of fear or anxiety. Also the thought of distasteful food tends to stop the flow of the gastric juice. The digestive organs really form a food factory—one which takes raw materials and converts them into materials for the cells which are to use them. When we overcrowd this factory the workmen are hampered or embarrassed, wastes of necessity accumulate, and the general quality of the food product goes down. When we introduce materials which the factory is not prepared to handle, similar results follow. If we would keep this factory running and in good shape, we must not work it overtime, nor irregularly; for it must have its periods of rest if it is to do good work. Let us then take very great care of this wonderful machinery; for once any part of it is broken or injured, its repair becomes a serious matter. (For a picture of the process of digestion *see* Physiology.)

DIOGENES (*dī-ŏg'ĕ-nēz*) (412–323 B.C.). Many anecdotes are told of this eccentric Greek philosopher. At one time, it is said, he was seen carrying a lantern through the streets of Athens in the daytime, and on being asked what he was looking for, answered, "I am seeking an honest man."

Diogenes came to Athens from the Greek colony of Sinope, on the Black Sea. He adopted the philosophy of the Cynics, who taught that to attain wisdom and virtue one must give up all the pleasures of life, which stand in the way of self-mastery. So he got rid of all his possessions, except a cloak and purse and a wooden bowl. He even threw away the bowl as unnecessary, when he saw a boy drinking from the hollow of his hand. It is said that he lived in a cask or tub, and in order to harden himself he used to roll in hot sand in summer, and in winter he embraced snow-covered statues.

At one time he made a voyage and was captured by pirates, who sold him as a slave in Crete. When asked his trade he replied that he knew no trade but that of governing men, and that he should be sold to a man who needed a master. He was sold to a master, who took him to Corinth to conduct the education of his children, and there he became famous.

Once Alexander the Great came to see him at Corinth and asked him if there was any favor he could do him. Diogenes replied that the only thing Alexander could do for him was not to stand between him and the sun. Alexander was so struck with this answer that he said: "If I were not Alexander, I would be Diogenes." Diogenes died at Corinth, and a pillar was erected to his memory.

DIOGENES AND THAT LANTERN TRICK

The Greeks, famous for so many other things, were no more distinguished for honesty than other peoples of their time. In order to bring the matter home to them, Diogenes resorted to this little ruse of carrying a lantern in the daytime, so that they would ask him why, and he could reply that he was "looking for an honest man."

DIONYSUS (*dī-ō-nī'sŭs*). A beautiful youth, glowing with vigor and attired in radiant garments, was wandering alone on a sea-beach in Greece—so the old story tells us—when a band of pirates approached. Knowing that his beauty would command a good price in the slave markets of Asia, they seized the youth and carried him to their vessel. But scarcely was he on board when the fetters dropped from his limbs.

"We have tried to bind a god!" cried the pilot, as he beheld the miracle. "Let us hasten to restore this youth to the spot whence we took him, lest the immortals, for our impiety, afflict us with adverse winds and storms."

Heedless of these words, the pirates set sail for the open sea. But presently the ship stood still. Tendrils of ivy twined about the oars, the masts and sails were quickly covered with vines laden with ripening grapes. Strains of magic flutes were heard and streams of fragrant wine trickled over the vessel.

The terrified crew entreated the pilot to steer for the shore. But it was too late. The youth changed into a roaring lion, and rushing upon the captain tore him in pieces. The sailors maddened with terror leaped overboard and were changed into dolphins. Only the pious steersman escaped this fate. The captive, resuming his true form, revealed himself as the great Dionysus, the god of the vine and the growing principle of Nature, whom the Romans called Bacchus.

This is but one of the many adventures that befell Dionysus, during a time when he lived on earth and traveled from country to country, teaching men to cultivate the grape and to make wine. Often he rode in a chariot drawn by lions and leopards, and was attended by satyrs and bands of dancing women called Bacchantes. The satyrs were woodland deities, represented as half human, half goat—hairy creatures, with pointed ears, broad snub noses, and short tails, dancing on cloven hoofs to the weird music of their flutes. The Romans called them fauns.

Dionysus was the son of Zeus (Jupiter), the god of the sky, and of Semele, a goddess representing the earth. In his early years he was cared for by an aged satyr named Silenus, who remained one of his favorite companions. Dionysus was represented in works of art as a beautiful youth, crowned with vine leaves or ivy, and wearing a faun skin over his shoulders. His festivals were celebrated with processions, dances, and choruses, out of which grew the Greek drama and the Greek theater. In Rome the Bacchanalia, or festival of Bacchus, was celebrated every third year; but it became so immoral that in the year 186 B.C. the Roman Senate forbade its further observance. (*See* Drama.)

DIPLOMATIC SERVICE. The old joking definition of an ambassador was that he was a man "sent to *lie* abroad for his country." The joke consisted in the fact that you might take the word "lie" either in its then common meaning of "reside" or in the other and less honorable sense. Unfortunately, the older diplomacy, which was largely an unscrupulous battle of wits, only too often made the latter meaning the more fitting one.

But today the demand for more frank and open relations between nations has changed the standards of diplomatic conduct, and the value of the members of the diplomatic service of modern countries is no longer judged by their skill in international trickery.

Every great country appoints ambassadors or resident ministers to represent it at the capitals of other countries, and on occasion sends "ministers plenipotentiary" on special missions. Both ambassadors and ministers serve as the chief channels for official communication between the countries they represent. But only ambassadors are looked upon as the direct representatives of the head of the nation and as such have the right to personal audience with the sovereign or chief of the country to which they are accredited. In ceremonial gatherings they take precedence over all save heads of government.

Diplomats have been important officials since the time of the Byzantine Empire. At first ambassadors were sent only on special missions to the courts of the barbarians or to Rome. But these proved so valuable that Venice developed the practice of sending permanent representatives to neighboring states, and the custom soon became general. Today when the telegraph and wireless place the capitals of the world in almost instant communication, the task of diplomats is lighter and their authority far less than in former days.

In addition to ambassadors and ministers, who are appointed by the President, the diplomatic corps of the United States, like that of most other nations, includes secretaries of various grades who assist their chiefs in the routine work of office. These positions are under civil service, and vacancies at the bottom are filled by competitive examinations. All American citizens are eligible for the examinations who have had a good general education and who speak and write fluently either French, Spanish, or German.

Closely related to the diplomatic service is the consular service. Consuls are commercial representatives, "a nation's lookouts on the watchtowers of international trade." They are stationed at all the important centers of commerce in the world and not only supervise the exports to their own country, and give advice and help to their countrymen abroad, but they must also seek out commercial opportunities in foreign lands and report these to their home governments. These reports in the United States are issued as the daily *Commerce Report* and sent to thousands of manufacturers all over the land. Both diplomatic and consular services are branches of the Department of State.

The division of diplomatic representatives into the four ranks—ambassadors, ministers plenipotentiary, ministers resident, and *chargés d'affaires*—was made by the Congress of Vienna in 1815. Until 1893 the United States withheld the rank and title of ambassador from its accredited representatives, but since that date it has sent ambassadors to capitals of note, especially where these foreign nations were represented by an ambassador at Washington. Diplomatic representatives are exempt from arrest for ordinary offenses committed in the country to which they are accredited, and their residences abroad, called embassies in the case of ambassadors, and legations in the case of ministers, are looked upon as part of the soil of their home countries.

DISRAELI (*dĭz-rā'lĭ*), BENJAMIN, EARL OF BEACONSFIELD (1804–1881). A clever novelist and a brilliant statesman were combined in Benjamin Disraeli, who became the great rival of Gladstone in the House of Commons, and twice held the position of prime minister to Great Britain. In his early years Disraeli was handicapped by the fact that, though a Christian himself, he was the son of Jewish parents; and he needlessly handicapped himself by his foppish dress—his perfumery, lace, jeweled satin shirt-front, profusion of expensive rings outside his gloves, green velvet trousers, and other extremes of fashion. His speech and manner were as affected as his dress, and the first time he tried to make a speech in the House of Commons he was ridiculed so that he had to give up the attempt. But before he did so he shouted, "I shall sit down now, but the time is coming when you will hear me."

Disraeli worked hard to make this prophecy come true. He studied the style of parliamentary speakers. He gave up many of his peculiarities of dress and manner. And he had his reward, for before his death his speeches were anxiously awaited, and the debates between him and his great rival Gladstone, the leader of the Liberal party, were some of the keenest that had ever been held in the House of Commons. Disraeli was especially clever at making catchy phrases. In 1846 when Sir Robert Peel, the Tory (Conservative) leader abandoned the position of his party and advocated the repeal of the Corn Laws—a Whig measure—Disraeli declared that Peel had "caught the Whigs bathing and had walked off with their clothes."

Finally Disraeli became the leader of the Conservatives in the House of Commons, even though he was not a large landowner; for he had the brains which, after Peel's death, were so sadly lacking on that side of the house. Under his leadership the Conservatives no longer opposed all progressive measures, and in 1867 he persuaded them to "dish the Whigs" by carrying through a Parliamentary Reform Bill extending the right to vote even further than the Whigs (Liberals) had suggested.

In 1868 Disraeli realized the "wild ambition" of his first years in Parliament and became prime minister as head of the Conservative party. His ministry fell within a year, but in 1874 he was again called to the premiership, this time remaining in office for six years. As premier he was much more acceptable to Queen Victoria than was Gladstone. He himself explained this partiality by saying that "Gladstone addressed the Queen as a public meeting, but he (Disraeli) addressed her as a woman."

Disraeli's foreign policy kindled the British imagination by picturing a far-flung empire bound together in an indissoluble union. He was the founder of modern British imperialism. He purchased for Britain from the bankrupt Khedive of Egypt his shares in the Suez Canal and so safeguarded England's route to India. He captured the fancy of the British, as well as of her temperamental Oriental subjects, by having Queen Victoria proclaimed "Empress" of India. He played a clever part against Russia in the Congress of Berlin (1878), blocking her progress in the Balkans and saving Turkey.

When he brought back "peace with honor" from Berlin, he was rewarded by the Queen with the title Earl of Beaconsfield and a seat in the House of Lords. In the elections of 1880 the Conservatives were defeated and he retired from office, dying within a year thereafter. But Conservatives still cherish his memory and on the anniversary of his death members of the Primrose League wear his favorite flower, the primrose.

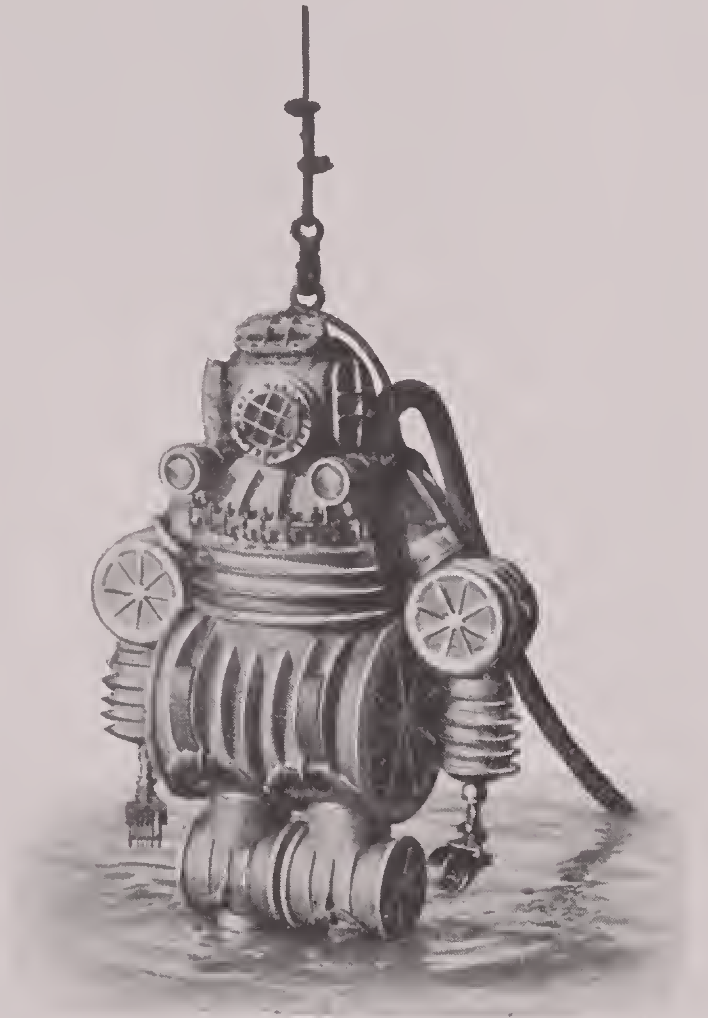
Disraeli's success as a writer was due largely to his political experience, for he was the first successful author of political novels. Some of the best known of Disraeli's writings are 'Vivian Grey' (1826); 'Henrietta Temple' (1837); 'Coningsby' (1844); 'Sybil' (1845); 'Tancred' (1847); 'Lothair' (1880).

DISTILLATION. In many parts of the world the only sure way of getting pure drinking water is by the process called distillation. This consists simply of catching the steam from boiling water and cooling it until it turns back to liquid form. Water so obtained is pure, for the rising steam does not carry with it any of the solid impurities from the original water.

Any liquid, if you get it hot enough, will boil and give off vapor, which may be cooled and condensed in the same way as steam; hence distillation finds many other important uses. Chief of these is the process called "fractional distillation" employed in producing, among other things, gasoline and kerosene from crude petroleum, in making alcohol, perfumes, etc.

This process rests upon the principle that different substances will boil at different degrees of heat. If you heat a mixture of water and glycerin, for example, the water will begin to turn to steam long before the glycerin gets hot enough to give off its vapor. By keeping the temperature high enough to vaporize the water, but not high enough to vaporize the glycerin, you can collect and condense the water vapor, leaving the glycerin behind. In the same way, when petroleum is heated the gasoline will come away before the kerosene.

THE ARMORED KNIGHT OF TODAY



This is a diver in one of the latest styles of men's wear—hardware, obviously. The heavy armor is for resisting the tremendous pressure of the water at great depths. The steel "hands" are worked by the man inside Notice the electric lights on both sides of the neck, for guiding the diver in his work in the dark world to which he is being lowered by a rope attached to headpiece of the diving suit.

DIVING. The man in the deep-sea diving suit is a modern knight in armor. He battles not against cold steel but cold water, in fluid darkness fathoms down. The very air he breathes is supplied by patient men ashore or in a boat above, slowly working an air pump. For every 10 feet he descends he sustains an added water pressure of nearly 4½ pounds over every square inch of his body (*see* Water). Hence he must descend slowly, not outdistancing the rate at which the pumps can supply the proper air pressure; otherwise he may suffer great pain, bleeding at the nose, eyes, and ears, and even losing consciousness or dying. And he must ascend even more slowly lest air be forced into his tissues, causing extreme torture, or lest he literally burst from internal air pressure.

It is dangerous for divers to work at a greater depth than 150 feet, although these brave men have often worked at depths greater than 200 feet. One of the deepest dives ever made was 288 feet—attained in 1915 by the diver who located the United States submarine F-4 on the ocean bottom, after it had sunk off Honolulu with 21 sailors. It took this diver two hours and five minutes to descend; twelve minutes to find the ill-fated boat; and one hour and forty-five minutes for him to ascend.

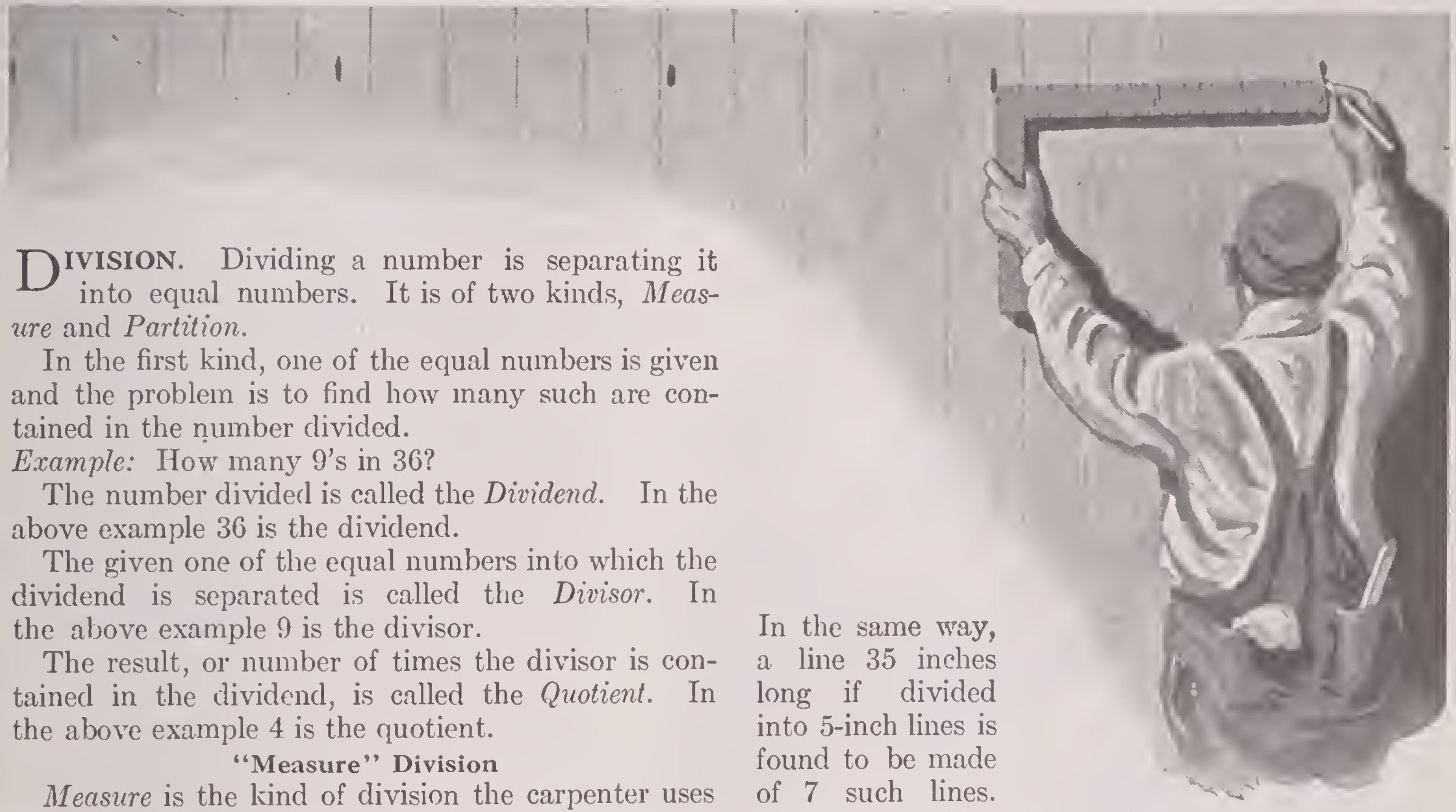
Perhaps the most interesting work of the diver is the salvaging of treasure and wrecked ships. From one Spanish vessel alone, which sank off the Grand Canary Island in 160 feet of water, divers recovered chests of gold worth nearly half a million dollars. Considerable results have been achieved in salvaging vessels sunk during the World War of 1914–18.

In the construction of bridges, dams, under-river tunnels, waterworks, etc., divers survey for foundations, caissons, and pile-settings. Waterworks in large cities employ a diver constantly. The United States Navy trains divers in huge steel-pressure tanks, thus artificially reproducing deep-water conditions, and employs many—at least two to every battleship—to set submarine mines, locate lost torpedoes, and examine ships' bottoms. Deep-sea divers are also used in several industries, as in fishing for pearls, corals, sponges, and shells, although dark-skinned swimmers of the tropics often perform such work without any equipment. Some of these natives can dive to great depths and remain under water two or more minutes.

Diving dress or armor may be of metal or rubber. Perhaps the most efficient suit is one of aluminum alloy, weighing about 500 pounds. The helmet is usually of copper, with "windows" covered with thick glass. Leaden weights are attached to enable the diver to descend rapidly and the shoes have lead soles to enable them to keep their balance, feet down. They communicate with fellow workers on the ocean bottom and with attendants above by cords, speaking tubes, or telephonic apparatus. Air is supplied from a pump above through a flexible tube entering the helmet. The poisonous breathed air escapes either through another tube leading out from the back of the helmet, or through an ingenious valve arrangement.

Some suits are "self-contained," making the diver independent of any connection with persons above water. In one such suit a compressed-air reservoir on the diver's back supplies him with air by a self-regulating apparatus. When he wishes to ascend he simply inflates his dress from the reservoir. In another form the air breathed is filtered and regenerated by means of an oxygen helmet. The oldest successful diving apparatus, still occasionally used, is the diving bell, a big iron cylinder closed at the top and open at the bottom. When this is lowered into the water the air in it keeps the water out. Fresh air is pumped in from above and a special arrangement allows the foul air to escape.

MASTERING *the Art of* DIVISION



DIVISION. Dividing a number is separating it into equal numbers. It is of two kinds, *Measure* and *Partition*.

In the first kind, one of the equal numbers is given and the problem is to find how many such are contained in the number divided.

Example: How many 9's in 36?

The number divided is called the *Dividend*. In the above example 36 is the dividend.

The given one of the equal numbers into which the dividend is separated is called the *Divisor*. In the above example 9 is the divisor.

The result, or number of times the divisor is contained in the dividend, is called the *Quotient*. In the above example 4 is the quotient.

"Measure" Division

Measure is the kind of division the carpenter uses when he measures the wall with a 2-foot rule by dividing it into equal parts of a given size (2 feet).

As he measures he says to himself, 2, 4, 6, 8, 10, 12, etc. When he wishes to saw a board into equal lengths, he lays off the distances in the same way so as to divide it into equal parts of a given length. He then counts the number of parts.

But it is possible to avoid actual measuring with a ruler and also to find relations that cannot be found by measuring spaces. This is done by counting so as to measure one number in terms of another. Thus a carpenter knows that a 16-foot board can be divided into 8 two-foot spaces by counting 2, 4, 6, 8, 10, 12, 14, 16, and observing the number of 2's. In this way he measures 16 in imagination and finds it 8 times 2. The bank teller knows in the same way that a $10 bill equals five $2 bills. This is a fact that could not be discovered by physical measuring.

Examples:

1. A boy with 35 cents wishes to find how many pears worth 5 cents apiece he can buy. He counts by 5's thus: 5, 10, 15, 20, 25, 30, 35; and notes how many 5's he has counted. Thus he measures the 35 by using the 5 as a measure. He finds that where 35 is divided into 5's, it is seen to be composed of 7 of them. In the same way, a line 35 inches long if divided into 5-inch lines is found to be made of 7 such lines. So 35 of any thing divided into groups of 5 of the same thing equal 7 groups. This is expressed thus: 35 divided by 5 is 7, or $35 \div 5 = 7$.

2. How many $5 bills are required to make $35?

3. How many square yards of plastering are there in a ceiling containing 648 square feet? $648 \div 9 =$ what?

4. How many gallons in 24 quarts of milk? 24 quarts ÷ 4 quarts = what number?

5. How many 4-inch strips can be cut from a piece of ribbon two feet long? Only like quantities may be compared by division. Hence we must first convert the feet into inches (2 feet = 24 inches), and state the problem thus: 24 inches ÷ 4 inches = what?

"Partition" Division

When a given number is divided into a number of equal parts, the process is called *Partition*.

Examples:

1. If a 12-foot board is sawed into 3 equal parts, how long is each part?

2. If Kenneth divides 12 marbles equally among 3 boys, how many marbles will each get?

Evidently the carpenter must divide the board into thirds and the boy must divide the marbles in a similar way. However, he can distribute the marbles one at a time. Let him give Martin, Albert, and Henry each one, then each one more, and so on until all are distributed. Kenneth will give out 3 marbles each time around. Each boy will receive as many as there are 3's in 12, or 4. Hence we say one-third of 12 is 4, and by knowledge of this and other similar facts the carpenter is enabled to divide boards into a given number of equal parts. Knowing that $\frac{1}{3}$ of $12 = 4$ ($12 \div 3 = 4$), the carpenter makes marks 4 feet apart with the assurance that the marks for sawing will prove to be in the right place.

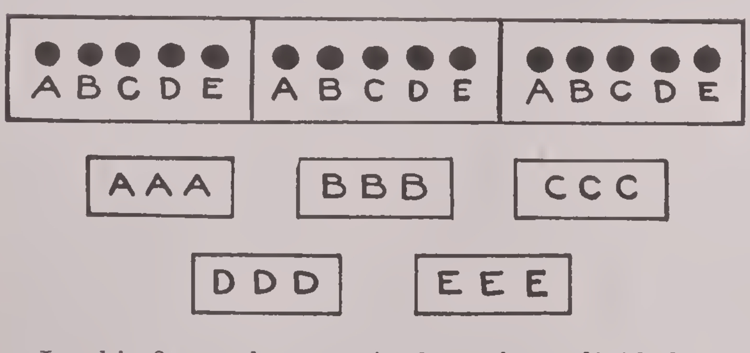
3. Four boys earn 36 cents which they wish to divide equally. How much should each receive? $\frac{1}{4}$ of 36 cents = how many cents?

4. Edward was sent to the grocery to buy one pound of sugar. As the grocer was weighing it out he said: "Let's see how good you are at figures. I sell five pounds of sugar for forty cents. How much should I charge you for one pound?" What was Edward's answer?

5. A horse traveled 40 miles in 8 hours. What was the rate of travel per hour?

The Relation of Partition to Measure

Both kinds of division problems (*Measure* and *Partition*) are worked by the same process of calculation. Thus, if we wish to find how much $\frac{1}{5}$ of 15 is (*Partition*), we may find it from knowing how many 5's there are in 15 (*Measure*).



In this figure the 15 units have been divided into groups of 5. Call the units in each group A, B, C, D, E. If they are distributed to 5 persons, the first person will get the first unit from each group (the A's), the second person the second unit (the B's), etc., each person receiving 3; but each person receives $\frac{1}{5}$ of the total. Therefore, "$\frac{1}{5}$ of 15 is 3" is true because the number of 5's in 15 is 3. Therefore, any Partition problem may be calculated by the same process as a similar Measure problem.

1's	2's	3's	4's	5's	6's	7's	8's	9's	
in									
1	2	3	4	5	6	7	8	9	=1
2	4	6	8	10	12	14	16	18	=2
3	**6**	9	12	15	18	21	24	27	=3
4	**8**	**12**	16	20	24	28	32	36	=4
5	**10**	**15**	**20**	25	30	35	40	45	=5
6	**12**	**18**	**24**	**30**	36	42	48	54	=6
7	**14**	**21**	**28**	**35**	**42**	49	56	63	=7
8	**16**	**24**	**32**	**40**	**48**	**56**	64	72	=8
9	**18**	**27**	**36**	**45**	**54**	**63**	**72**	81	=9

In order to compute division, it is necessary to know certain elementary facts. The association of these numbers must be so fixed in the memory as to be automatic, that is, the results must appear without hesitation. The 81 facts indicated in the above table are fundamental and should be practiced upon until they are thoroughly familiar.

Accuracy and speed in division are acquired in these ways: (1) by mastering the "fundamental facts," or division tables; (2) by computing with as few words in mind as possible; (3) by care in writing each figure so that it falls directly in line with those above it; (4) by mentally testing the correctness of a figure in the quotient before writing it; (5) by testing the final answer.

For practice in the fundamental facts as involved in uneven division, that is, when the divisor is not contained an even number of times in the dividend, the following exercises will be found helpful.

Find quotients:

2)4	2)10	2)16	3)9	3)27	3)33
2)5	2)11	2)17	3)10	3)29	3)35
4)12	4)20	4)36	5)25	5)30	5)45
4)13	4)23	4)38	5)27	5)34	5)48
6)42	6)54	6)36	7)21	7)49	7)63
6)47	6)59	6)40	7)24	7)52	7)69
8)24	8)40	8)72	9)36	9)54	9)81
8)27	8)45	8)79	9)41	9)62	9)89

Short and Long Division

There are two forms of division: *short division* and *long division*. Short division is used in dividing by a number of one figure. In this form of division only the figures in the quotient are written. The rest of the calculation is carried in the mind.

$$\begin{array}{r} 480 \\ 2\overline{)960} \end{array}$$

Find the quotients in these exercises by short division:

1. 6)568
2. 8)9655
3. 9)15432
4. 7)98746
5. 10)76482
6. 8)200416
7. 7)4732
8. 4)2116
9. 5)24806
10. 6)85329
11. 9)46681
12. 6)15116
13. 5)5263
14. 3)2004
15. 7)19019
16. 8)34702
17. 5)84763
18. 7)34816
19. 9)6248
20. 6)5084
21. 4)49048
22. 3)15161
23. 2)14631
24. 4)648161

```
     236 4/7
21)4968
   42
   ---
    76
    63
    ---
    138
    126
    ---
     12   4
     -- = -
     21   7
```

Long division is used in dividing by a number of two or more figures. Here according to the usual custom, the result of each step is written down. The order of work followed is: (1) divide; (2) multiply; (3) subtract; (4) form a new dividend. Repeat these four processes until all the figures in the dividend have been used. In dividing 4968 by 21, 49 is divided by 21 and the number 2 written in the quotient. The product found by multiplying 21 by 2 (42) is written under the 49. This product is subtracted from the 49, giving the difference 7. The next number of the dividend, the 6, is then brought down to form the new partial dividend 76. The process is then repeated.

Trial Divisors

32)176

To determine the true figures in a quotient, the first figures in the divisor and dividend are used as guides. In dividing 176 by 32, since 3 is contained in 17 five times, it is taken as probable that 32 is contained in 176 five times, and 5 is written in the quotient. In dividing by such a number as 28 it can easily be seen that 28 is nearly 30 so that it is better to use 3 as a guide in place of 2, and to think: since 3 is contained in 12 four times, it is probable that 28 is contained in 122 four times.

28)122

39)246

48)374

97)228

In dividing 246 by 39, we see that 39 is nearly 40. Since 4 is contained in 24 six times, it is probable that 39 is contained in 246 six times. So in dividing 374 by 48 we think of 37 divided by 5, which is 7. In dividing 228 by 97, we think of 22 divided by 10, etc.

A figure in the quotient is known to be too large when the product is greater than the part of the dividend in use. It is known to be too small when the remainder is greater than the divisor.

```
        2010
821)1650210
    1642
    ----
       821
       821
       ---
         0
```

In dividing, care is taken to place the first figure in the quotient directly above the last figure in the dividend used, and to place a figure in the quotient for each of the remaining figures in the dividend. Note that in the example at the left, the first figure in the quotient is placed above the fourth figure in the dividend, and since 82, the second partial dividend, does not contain 821, a zero is placed above the 2 in the dividend, and the new partial dividend 821 formed.

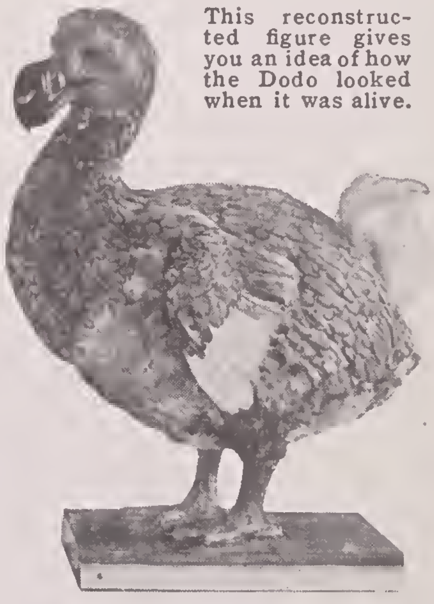
Find the quotients in these exercises by long division:

1. 9072 ÷ 21
2. 22050 ÷ 42
3. 44667 ÷ 63
4. 10086 ÷ 82
5. 39831 ÷ 51
6. 29756 ÷ 43
7. 29757 ÷ 91
8. 29408 ÷ 32
9. 60152 ÷ 73
10. 22356 ÷ 81
11. 3074 ÷ 29
12. 33630 ÷ 57
13. 15466 ÷ 38
14. 79344 ÷ 87
15. 32046 ÷ 49
16. 68748 ÷ 68
17. 195702 ÷ 78
18. 291388 ÷ 97
19. 15249 ÷ 39
20. 435888 ÷ 48
21. 143278 ÷ 142
22. 267167 ÷ 369
23. 1056852 ÷ 525
24. 1686656 ÷ 395
25. 2489592 ÷ 406
26. 1217958 ÷ 1234
27. 3839112 ÷ 4506
28. 2875166 ÷ 574

The usual test for division is to look at the quotient to see if it looks sensible and then to repeat the division. Another test is to find the *product* of the divisor and quotient, adding the remainder if there is one. The result should give the dividend.

DO'DO. "Simpleton" (*duodo*) was the name that Portuguese explorers gave this grotesque bird when, in the year 1507, they discovered it on the island of Mauritius in the Indian Ocean. It seems to have deserved its name, for it was so clumsy and stupid that it finally lost the struggle for survival and has been extinct since 1681. By the aid of drawings made by artists accompanying the early explorers, some bones discovered in a marsh in the island of Mauritius have been set in an almost complete skeleton of the dodo, now in the British Museum.

A FOOLISH BUT FAMOUS BIRD



This reconstructed figure gives you an idea of how the Dodo looked when it was alive.

In structure the dodo was related to the pigeon family, but it was not at all like a pigeon in appearance. It had a round fat body, twice as large as a turkey's, with short legs which could scarcely support its weight. Its tail was only a little tuft of curly feathers, its wings were small and imperfect and of no use for flying, and its head was very large, with an enormous hooked bill. It was so slow-moving that sailors hunted it with clubs, killing great numbers, and dogs and hogs completed its extermination.

A near relative of the dodo, the solitaire, which was also a gigantic flightless pigeon, inhabited the island of Rodriguez, near Mauritius. It survived the dodo by about 80 years.

MAN'S OLDEST *and Most* FAITHFUL FRIEND

"A Man's Dog Stands by Him in Prosperity and in Poverty, in Health and in Sickness. He Will Kiss the Hand That Has No Food to Offer. When All Other Friends Desert, He Remains"

The St. Bernard possesses dog-like qualities at their finest. Charged with the duty of finding travelers lost in the snow of the Alps, these dogs have done their work with a loyalty that has won them undying fame throughout the world.

DOGS. Clouds were pressing down upon the mountain peaks and the Alpine traveler groping bewilderedly through the blinding snow storm staggered on and on through the deep drifts, and at last fell and lay motionless. A few moments later a sharp cheery barking was heard above the howling wind, and rushing over the frozen crust and plunging through drifts bounded a great St. Bernard dog. Suddenly coming upon the lost traveler he crouched down in a protecting fashion, half covering him with his huge thick-coated body while he licked his face and hands with a warm soft tongue, and allowed the half-frozen man to unfasten the little flash of liquor and the basket of food that hung around his shaggy neck. Then seizing the man's cap he darted off into the storm, returning joyously in a short time with a rescuing party of monks.

The hero of this tale was Barry, the most famous of those big brave dogs trained for this rescue work, who, during the 12 years he lived with the monks in their lonely Alpine monastery, saved more than 40 lives. His figure today standing in the Museum of Natural History in Bern, Switzerland, and the imposing monument erected to him in the Dog Cemetery in Paris serve as constant reminders to man of what a dog can do.

Among the many animals made use of by man, the dog, his faithful friend and companion, stands first of all. Long before there were any pictured records of man's history the dog was his tamed companion; his bones were even found with those of Stone Age man. Scientists say that early men developed dogs for hunting purposes from the wild wolves of their particular regions. These were wolflike dogs such as the Eskimos use today, or such as are shown us in Egyptian pictures over 5,000 years old. Most kinds of dogs that we know, however, have been developed within the last few centuries to meet man's needs or his whims.

But our dog friends of today still have many queer little ways of reminding us of their wolfish ancestors. The hunting dog bays—a reminder of hunting wolves baying to keep the pack together. The dog howls at night—the ancestral habit of calling the pack. He sometimes howls, too, upon hearing certain music—does it remind him of the pack? He turns around before lying down because his ancestors had to do so in tramping down a flat sheltered bed in jungle grass or drifted leaves. And he stealthily buries his bones—even if it is only in a hearth rug—just as his wild forefathers buried theirs in the wilderness in order to prevent their enemies sharing them. The dog has to thank his ancestors, too, for his marvelous sense of smell, acute hearing, keen eyes, sharp teeth, strong legs for running, lean muscular body covered with the coarse protective hair—all of which fit him for the active life of the hunter.

THE "DANDY" OF DOGDOM

The playful Pomeranian learns tricks quickly.

The Belgian poet Maeterlinck tells us that the dog is the one animal that can follow man all over the earth and adapt himself to every climate and to every use to which his master chooses to put him. A striking example of the useful work a dog can do was shown us in the World War of 1914–18. The dogs "had a paw in the war" from the start—as rat killers, as Red Cross dogs for feeding and aiding the wounded, as sentinels, as messengers, and even (in the Belgian army) as haulers of machine guns. About 10,000 of these four-footed soldiers were "doing their bit" at the battle front when the armistice was signed, while more than a thousand sled dogs were used in the

Vosges Mountains during the last year of the war for moving food and other supplies up to mountain trenches.

Dog Heroes in the World War

And how gloriously these war dogs worked—dogs ranging from the Alaskan malamute to the noble St. Bernard, from the faithful Scotch collie to the wise little fox terrier! Bounding out into No Man's Land, with first-aid kits strapped to their collars, and hunting out the wounded; carrying big cans of hot soup through front-line trenches to cheer and strengthen the fighting men; stolidly mounting guard for hours at dangerous listening posts, their acute senses detecting an approaching enemy long before any man on such sentry duty could have done so; and plunging through barb-wire and a veritable hail of bullets to carry important dispatches or baskets of homing pigeons which were to carry messages farther than the four or five miles the dog could go.

Some dogs indeed proved veritable heroes and were mentioned in dispatches and decorated for bravery, as well as winning the devotion of countless soldier-friends. There was Fend l'Air, a black and white setter. When his master was buried by a shell explosion, the dog partially dug him out, then remained faithfully by his side for three days and nights, until finally he was rescued. There was Michael, the dog that unaided dragged his master—left for dead in No Man's Land—back to the trenches. There was Filax, the great sheep dog, who from time to time saved the lives of a hundred French soldiers lying wounded out in No Man's Land. And there were many others.

THE SHEPHERD'S INTELLIGENT HELPER

The long-haired Scotch Collie is the typical sheep dog of the world. It learns to know its charges so well that even in a crowded market it can adroitly separate them from other flocks. It also has an almost uncanny memory for places and directions.

The Faithful Friend of Man

In times of peace the dog proves himself a useful friend in many ways. We all know what a difference there is in the looks of dogs. Compare, for instance, a huge 300-pound St. Bernard with a tiny Chihuahua which can stand on your hand and weighs less than two pounds; or a tall lithe greyhound with a little short-legged Dachshund; or a shaggy Newfoundland with those queer little sausage-like hairless dogs of Mexico or Africa. All of these "friends of man" have as many different ways of serving him as they have colors and sizes and shapes. Only the expensive toy dogs—the Pomeranian, poodle, pug, Maltese toy dog, Pekinese, and Japanese spaniel—are developed merely as ornamental pets and have no real use except in the world of fashion.

THE DROVER'S SHAGGY FRIEND

This quaint-looking fellow with his bob-tail, the Old English Sheep Dog, is much used in England by cattle drovers.

"The dog is something of an aristocrat, ready for sport, keen on the watch, but not overly fond of work," says one writer. But we must not forget the sheep dogs, so knowing and hard working and useful. The Scotch collie, that honest wide-awake yeoman of the race, so loyal and intelligent, is now a favorite in every civilized land. When he has a flock of sheep to care for, he lives with them, gathers them from the distant pastures, brings them to the fold when they are needed, and will let no prowler meddle with his woolly charges. It is a wonderful sight to see one of these

HERE'S THE ONE WHO CAN HANG ON!

The Bulldog is famous for the mighty grip of his crooked jaws. But though he has a reputation for fierceness, today he's generally very good-natured.

''HUSKIES'' OF THE FROZEN NORTH

Eskimo dogs, or "Huskies" as they are sometimes called in Alaska, are not very far removed from the wolf in appearance or disposition. But these wiry deep-chested animals are among the most useful members of the dog family. They will drag heavy loads under the most trying conditions. Harnessed to a sledge a team will cover 60 miles day after day.

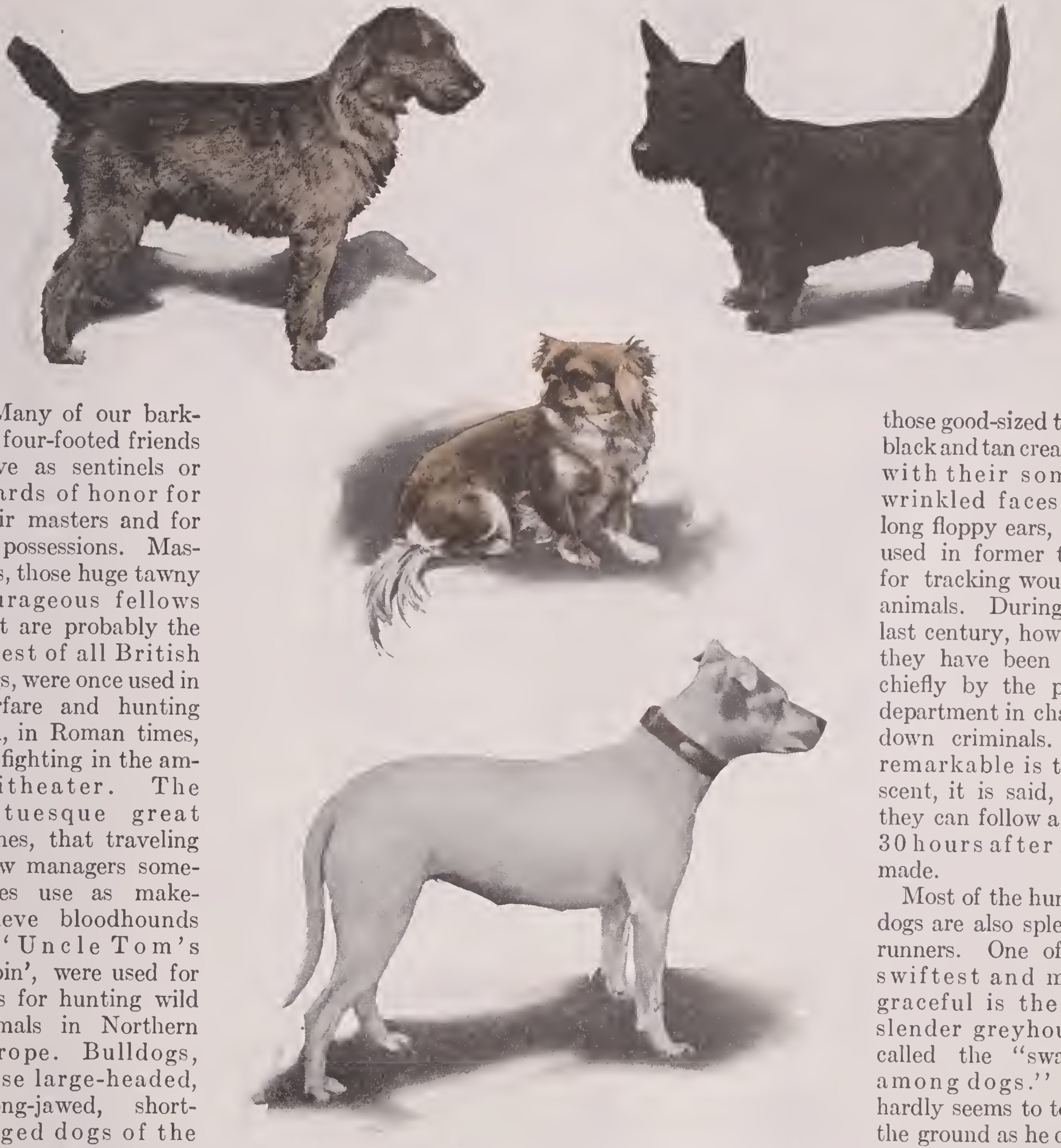
shepherd's assistants, at the sound of his master's whistle, scouring hill and dale, rounding up his flock—which may mean separating it from other sheep—guarding it, keeping it from straying or stampeding, and finally, without losing any of it, bring it safely home. Because of his remarkable sense of smell—so important a trait of all dogs—the collie and other shepherd dogs can trace and find sheep lost in snow storms.

The collie's skill in his native Highlands is charmingly portrayed in Ollivant's 'Bob, Son of Battle'—a book all lovers of collies should read—and many true tales are told that show how intelligent these animals are. Among them is the story of the American shepherd whose death in a lonely cottage remained undiscovered for two days. During this time his two dogs tended the flocks as usual, taking them to pasture, guarding them, and driving them back home again each night.

The Dogs of Holland and Belgium

Other dogs who work for a living are those in Holland and Belgium which are used to pull their masters' milk-carts, and to haul vegetables and other produce. Still others do their farm and household bit in harness in certain parts of Canada. Perhaps the most useful of all the working dogs are those of the Eskimos and other northern residents—wolflike dogs which, in teams of a half-dozen or more, draw the sledges that furnish most of the winter transportation in the Canadian and Alaskan wilds. These devoted hard-working animals have indeed played a noteworthy part in many Arctic and Antarctic explorations. Most of us already know the type through Jack London's story, 'The Call of the Wild'. As one writer puts it: "Is a pole to be discovered, man stands powerless before the ice and snow without the dogs of the North. Is an expedition to reach the interior of a bleak region in dead of winter to rescue some hapless explorer or pioneer, or to help an ice-besieged population fight an epidemic of fever or smallpox, then the sleds and the dogs make the trip possible." Dog-racing in the Far North is one of the chief winter sports, and when one of the racing teams finishes a 412-mile race over ice and snow in (let us say) 80 hours and 27 minutes, the excitement of the crowd gathered to see the finish is as great as over a baseball world's series.

TERRIERS ALL—TRIED AND TRUE



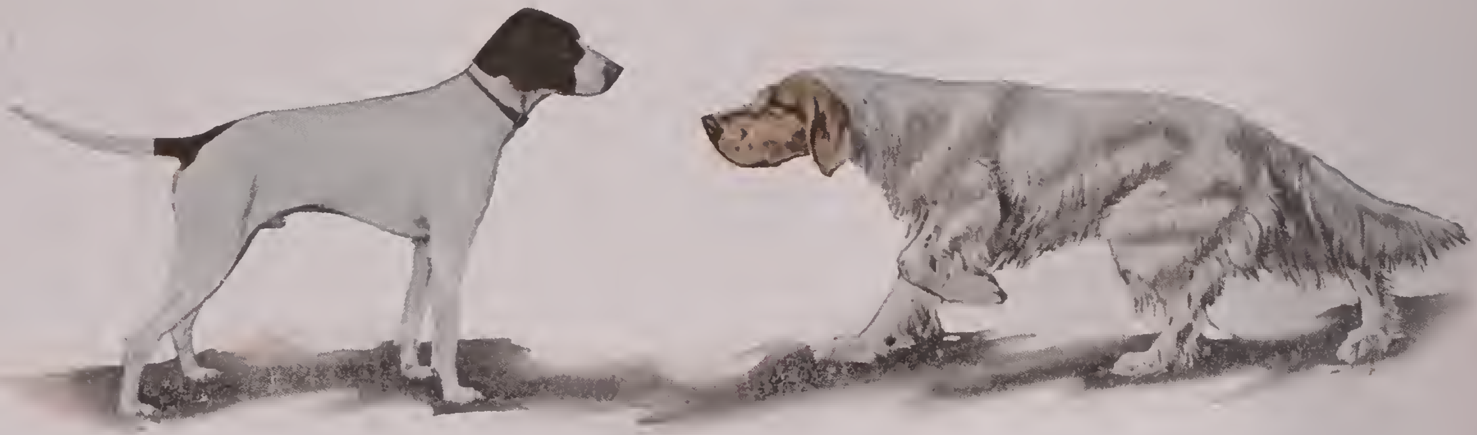
They look as different as can be, but they're all blood relatives. A short distance only separates the homeland of the Irish Terrier in the upper left-hand corner from that of the Scotch Terrier to his right, while the Chinese Terrier in the middle is more remote. The Bull Terrier below shows evidences of both the bulldog and the terrier in his parentage.

Many of our barking four-footed friends serve as sentinels or guards of honor for their masters and for his possessions. Mastiffs, those huge tawny courageous fellows that are probably the oldest of all British dogs, were once used in warfare and hunting and, in Roman times, for fighting in the amphitheater. The statuesque great Danes, that traveling show managers sometimes use as make-believe bloodhounds in 'Uncle Tom's Cabin', were used for ages for hunting wild animals in Northern Europe. Bulldogs, those large-headed, strong-jawed, short-legged dogs of the mastiff type, remarkable for their courage, homely smile, and ability to "hang on," were used in olden times for boar-hunting and for the cruel "sport" of bull-baiting. Today mastiff, dane, and bulldog and several others of their kin are all excellent watchdogs.

The aristocrats of the dog world are the hunting dogs. While every dog "knows with his nose," it is the bloodhound and the others of this class that have the most astonishingly keen scent. Like their wild ancestors they learned the trick of following the scent of one animal through the confusion of many other smells, and learned, too, even to pick up a trail on the farther shore of running water. The bloodhounds, those good-sized tan or black and tan creatures with their somber wrinkled faces and long floppy ears, were used in former times for tracking wounded animals. During the last century, however, they have been used chiefly by the police department in chasing down criminals. So remarkable is their scent, it is said, that they can follow a trail 30 hours after it is made.

Most of the hunting dogs are also splendid runners. One of the swiftest and most graceful is the tall slender greyhound, called the "swallow among dogs.'' He hardly seems to touch the ground as he darts along. Another graceful runner is the beautiful Russian wolf hound, which also is tall and thin, and is noted for its wonderful silky coat—usually white with tan markings. There are many other hounds that chase the elk, gazelle, otter, deer, and other game. One of the most popular hunting dogs is the foxhound, that white and black and tan hound that has been used for centuries in the sport of chasing the fox. Large packs are kept in England and America for this purpose. The beagle and basset are smaller hounds that hunt hares and rabbits. Among the staunchest allies of the sportsmen we must not forget the dogs that merely help them to kill their game, or retrieve it after the

TWO ARISTOCRATS WHO HELP THE HUNTER



When the Pointer, at the left, sights a game bird in the grass, he stands perfectly still, with tail extended and nose pointed at the quarry. The Setter, at the right, does the same work in a different way; he crouches or "sets" at the sight of the game.

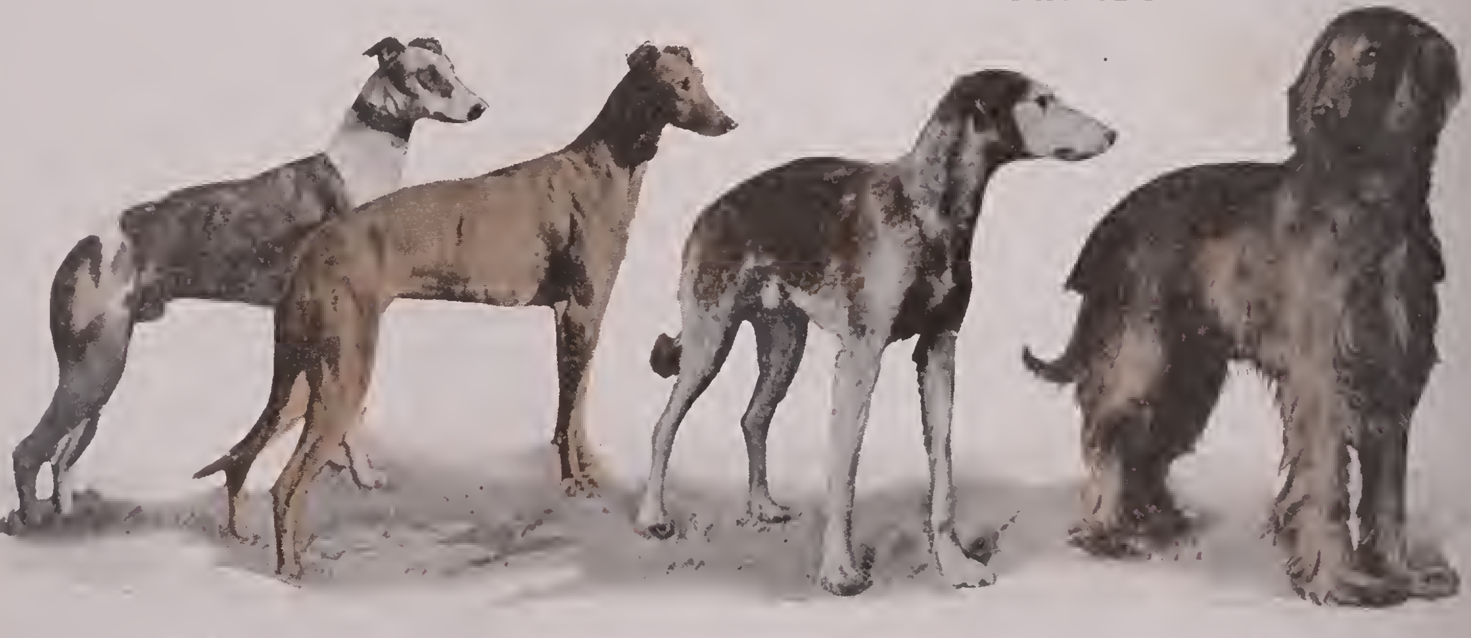
"BIG AND LITTLE" IN DOGDOM

The patient "under-dog" of the piece is Boy Blue, a famous St. Bernard, while the pert little rider is "Wonderful Tiny," a Yorkshire terrier.

killing. There is the pointer, who stands rigid when he scents the game (usually partridge, grouse or quail), and points to it with his nose. The affectionate setter with his plumy tail and long silky coat is also useful in hunting feathered game. He was originally taught to indicate the presence of birds by crouching or "setting," but now he is usually trained to "point." Various sorts of spaniels and retrievers—most of which are fond of swimming—are useful in bringing back to the hunter the game which he has shot.

The little dogs too do their share in the world of sport. Foxes, badgers, rabbits, rats, and other animals which seek refuge in ground burrows beware of the terriers, those small usually shaggy dogs of many varieties which, as their name suggests, go to the earth (in French, *la terre*) for prey. They are bright plucky mischievous little rascals and do their work well. A single rat terrier was once let loose in a room where a hundred rats had been collected. Like a streak of lightning he worked and in seven minutes had killed every one of them, one hasty bite putting each rat out of business. From the little short-legged skye

THE CHAMPION RUNNERS OF THE FAMILY

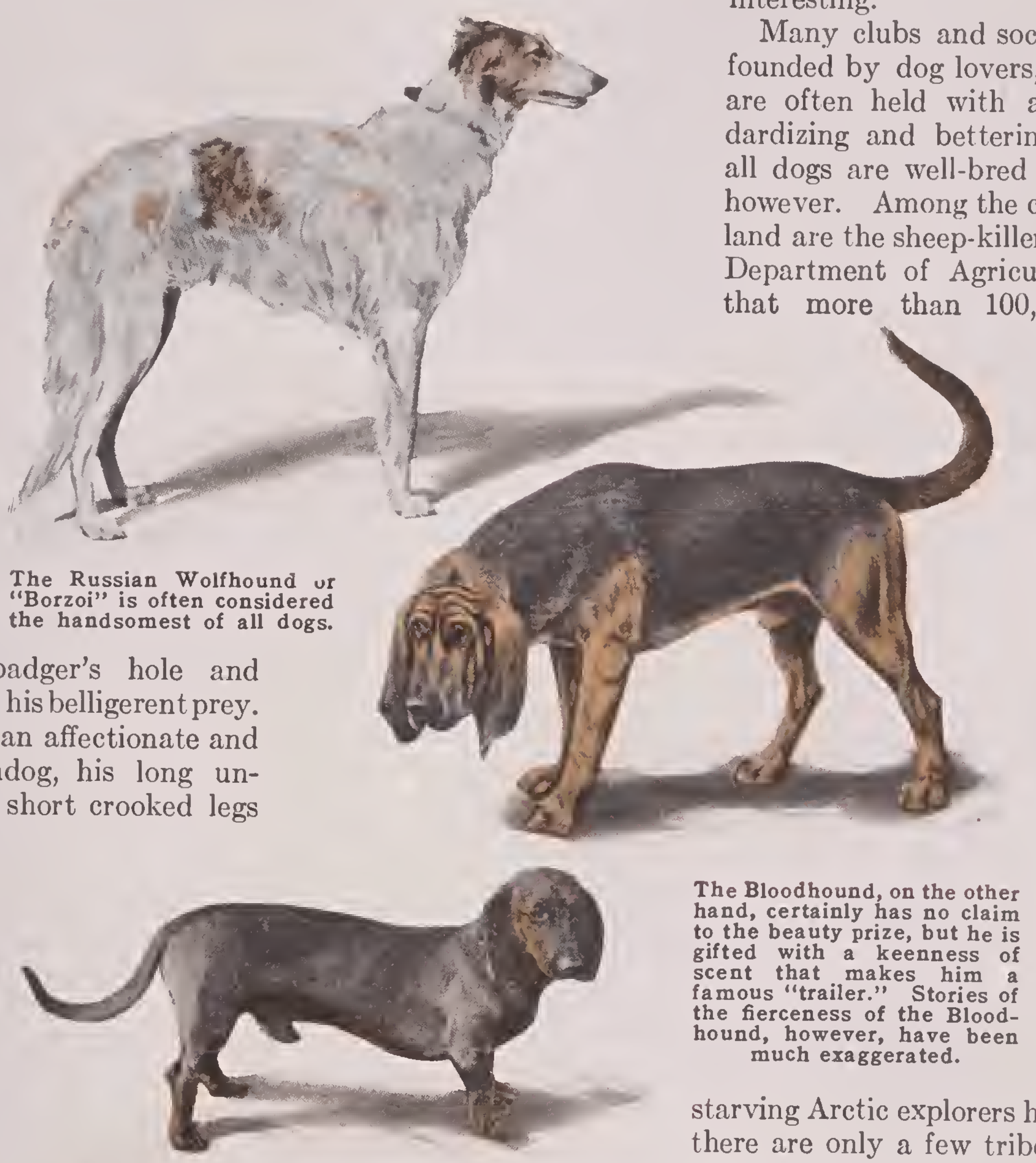


Greyhounds are an ancient breed of dog. They hunt by sight, and are a good match for even the swiftest animals. The two on the left are English Greyhounds; the third is a Deerhound, and the one to the right is the picturesque long-haired Afghan Greyhound.

terrier, half buried in his own hair, to the Boston terrier—the intelligent popular dog who shows traits of both his bull and terrier ancestors—the good-sized impetuous Airedale, and the bright jolly little fox terrier, these terriers are all knowing, tenacious, and self-reliant, and, if need be, will prove themselves "good sports."

About the most ridiculous-looking dog is the German dachshund (which means "badger dog"), who can enter a badger's hole and stolidly drag out his belligerent prey. Although he is an affectionate and a plucky watchdog, his long ungainly body and short crooked legs will prevent him from ever becoming popular with people who like good-looking dogs. In Germany it is often said that the dachshund is "sold by the yard!"

SOME STRANGE DOG TYPES



The Russian Wolfhound or "Borzoi" is often considered the handsomest of all dogs.

The Bloodhound, on the other hand, certainly has no claim to the beauty prize, but he is gifted with a keenness of scent that makes him a famous "trailer." Stories of the fierceness of the Bloodhound, however, have been much exaggerated.

The German Dachshund is one of the most curious members of the dog family. The story goes that his race was bred for those short crooked front legs, so he could crawl into holes after badgers.

Yet, whatever the breed, the dog above all else means to us a quick-witted, plucky, faithful playfellow and protector, of whose unselfish devotion and other almost human qualities we have countless proofs. Dog lovers tell us many wonderful anecdotes of these knowing sympathetic tail-wagging friends of ours. Although some of these stories are so marvelous that they remind us strangely of certain "fish stories" we have heard, many authentic ones prove how clever, faithful, enduring, docile, loving, and unselfish our dog friends can be. Not all dogs lie down and die on their master's grave, unwilling to leave him even after death; not all dogs rescue people from drowning as do the shaggy water-loving Newfoundland; not all dogs do wonderful circus tricks; not all throttle burglars and perform various other heroic deeds; nor do many of them develop curious habits like the globe-trotting Owney, the railway postal clerk's dog, who traveled all over the world; or like Flock, the dog who insisted upon riding in airplanes. Yet we all know some dog who has done things almost as interesting.

Many clubs and societies have been founded by dog lovers, and dog shows are often held with a view to standardizing and bettering breeds. Not all dogs are well-bred or well-trained, however. Among the criminals of dog-land are the sheep-killers, and the U. S. Department of Agriculture estimates that more than 100,000 sheep are killed annually by dogs. The dog has also been known to spread diseases, the most terrible being rabies or hydrophobia. But in general the services and the friendship of dogs to mankind have far outweighed the bad qualities of the few. And on the whole these "better sides" are recognized the world over. Although starving Arctic explorers have eaten dogs, there are only a few tribes in the world (such as the Igorots) that do so habitually. (For advice on keeping dogs healthy, *see* Pets.)

The dog is a mammal of the order *Carnivora* and of the family *Canidae*. Breeds of dogs have been classified in various ways. One of the latest classifications is as follows:

Wolflike Dogs.—Arctic sledge dogs; shepherd dogs (collies); Newfoundland dog; St. Bernard, rough and smooth; Pomeranian or Spitz dog.

Greyhounds.—Old Irish wolf dog; modern Irish wolf dog; greyhound; Italian greyhound; West Indian naked dog (presumably).

Spaniels.—Many varieties.

Hounds.—Bloodhound; foxhound; harrier; hunting dogs (otterhound, beagle, pointer, setter, etc.).

Mastiffs.—Mastiffs; bulldogs; pugs, etc. (the "watchdogs," notable for variety of size).

Terriers.—English, Scotch, Irish, and Skye terriers; fox terriers (pure); black-and-tan terriers, turnspits, and the Oriental pariah dogs.

The Story of Greyfriars Bobby

Bobby was a small Skye Terrier

WOULDN'T you like to have a little dog all your own? A dog is such a merry loving playmate. He is always ready to run and play when you are well and happy. And if you are sick he is so sorry. He licks your hand to show how much he loves you, and lies quietly by your bed. And if you go away on a long visit, he does not forget you. When you come home he jumps on you, and barks and wags his tail almost off with delight.

I am going to tell you about a little dog who never forgot his master. His name was Bobby. He was a Skye terrier, so he was only ten inches high and less than two feet long when he was grown up. All the little Scotch children who knew him called him the "bittie doggie," because he was so small. He had a rough wavy coat of silver-gray hair, so long that it almost touched the ground when he stood up. Under this hair was a woolly fleece, like a little lamb's, to keep Bobby warm. The rain and snow could not wet Bobby. The wind could not get through his thick coat. He could sleep out of doors in the winter, and keep as warm as your breakfast toast.

Bobby had the snappiest bark, for he was a merry little rascal of a dog. He had soft floppy ears, fringed with silvery hair. His tail was as pretty as a plume in a lady's hat. A veil of hair fell down his face and almost hid his bright brown eyes. When he looked up at his master his eyes were soft and full of love.

Bobby lived on a big sheep farm, near the beautiful old city of Edinburgh, Scotland. He was not a shepherd dog, and could not help take care of the sheep. But he could catch rats. So he kept the rats from eating little chickens and birds, and from stealing the farmer's grain. All kinds of terriers are good rat catchers. So Bobby made himself useful. He loved everyone on the farm, and everyone loved Bobby. But he loved Old Jock the best of all. Old Jock was a poor old man who worked on the farm as a shepherd. He had no home. He had no wife and children. Even Bobby did not really belong to him. But Bobby loved him, and chose him for his master.

Every morning Bobby was up before the sun. He poked his little black wet mop of a nose into Old Jock's face. He woke his master up with excited barks. All day he ran and scampered at the old shepherd's heels. He followed him over the steep rocky hills, after the sheep. He was so happy and full of fun that he barked at the butterflies.

At night Old Jock taught him pretty tricks. He taught him to sit up and beg for his supper. He taught him to roll over and over. He taught him to be polite and friendly to everyone, and to make himself useful. When Bobby caught a big rat in the chicken house, Old Jock patted him on the head and called him a "good dog." His master took him to church and told him not to be noisy in a churchyard.

Bobby was still a puppy, less than a year old, when the farmer said: "The summer work is all done, Jock. The winter work on the mountains is too hard for so old a man. You can get something easier to do in the city. Bobby must stay here."

But Bobby would not stay. Although he was a little country dog, and did not like the noise and dirt and bad smells of the city, he would not desert his beloved master. Barking a cheerful "good-bye," and with his gallant little plume of a tail in the air, he followed Old Jock to the city. It was a dark cold autumn day. Rain was falling in the market place. A bitter wind was blowing. Poor Old Jock was so tired that he lay in a broken-down wagon in the market, and went to sleep. Bobby was warm and dry; but he knew his master was cold and wet. So he barked and barked.

"Get up, master!" he barked. "Let's go to that nice warm little shop we know, and get some hot supper. There's the jolliest fire, and the kindest man in that restaurant."

They had a nice warm evening. But Old Jock had very little money. He could only rent a cold room in the poorest part of the city. He had a fever, and he coughed all night. Bobby lay on the bed beside his sick master and licked his hot hands. He tried to comfort him and make him well. But Old Jock did not get well. One morning Bobby could not wake his master up. Old Jock had died.

Bobby had lost his master. A broken-hearted little dog, he followed the men who laid Old Jock away in Greyfriars churchyard. That night he slept on the grave of his master. The caretaker put him out, for dogs were not allowed in the beautiful old cemetery. But Bobby came back. The farmer carried him home and locked him in the cow barn. But Bobby dug his way out, under the door. The city was five miles away, and Bobby's feathered legs were not five inches long, but he went back. He caught rats in the churchyard, and showed them to the caretaker.

"See," he said, "I'm just a little scrap of a dog, but I can catch rats, and chase away the cats, and protect the little birds in their nests. And I'll never bark or make a noise in this quiet place where my master sleeps. Please let me stay with Old Jock."

So the caretaker let him stay. He loved Bobby. He gave him a bath every Saturday and combed his hair, so that his coat shone like silver and rippled to the floor. The schoolboys loved Bobby and took him on long tramps in the country. The good friend in the restaurant fed him every day. The poor children, who lived in the tall old tenements around the churchyard, loved him. Every night they held lighted candles up at the windows and called out: "A good night to you, Bobby."

Many homes were offered to Bobby. Great ladies in fine homes wanted him for a pet. The man who fed Bobby begged the little dog to live with him. The soldiers in the Castle on the hill tried to keep him in the fort, but Bobby escaped. He scrambled down the steep rock 200 feet high, in the night, and hurt himself. The caretaker who lived in a cottage by the gate tried to make him sleep in the warm kitchen. But Bobby would not leave his master alone at night. He went outside every day, but at sunset he returned to Old Jock's grave.

Bobby did not really belong to anyone. A policeman thought he was a stray dog, and took him up. So the poor children who loved Bobby gave their pennies to buy him a collar. But the Lord Provost of Edinburgh heard about it. And when he learned the little dog's story, he gave Bobby a beautiful collar with his name on it. What do you think it was? "Greyfriars Bobby." Crowds of people came to the old churchyard to see the little dog that had never forgotten his master. They all loved Bobby, and they laid flowers on Old Jock's grave.

Those Sad, Sad Eyes!

In 15 years Bobby was an old dog. His silver coat turned as white as snow. But he still caught rats and chased out the cats. As long as Bobby lived, the churchyard was full of bird's nests, and gay with the songs of the birds. Even in the daytime Bobby often dropped on his master's grave and went to sleep in the sun. He was friendly to everyone. He loved to be with the children. Sometimes they pushed the veil of hair back and looked into his soft brown eyes. His eyes were so sad with longing for his master that children said, "Oh mother, Bobby's crying."

Then a very rich kind lady, who loved animals, heard about Bobby. And she thought that everyone in the world should know the story of this loving little dog. He should never be forgotten.

So she had a fountain set up outside the churchyard gate. It had a low basin, where all the dogs of Edinburgh could always go for a drink of fresh cool water. And on top of the fountain she put—what do you think?—a little bronze dog, with crinkly hair and a friendly tail; a perfect copy of Bobby!

This happened a long, long time ago, when grandfather was a little boy. But you can see that fountain, with the bronze copy of Bobby on it, in Edinburgh today. In the caretaker's cottage by the gate you can see Bobby's famous collar. And in Greyfriars churchyard you can see the grave of Old Jock, where Bobby sleeps with his master.

[Retold from 'Greyfriars Bobby' by Eleanor Atkinson, by special arrangement with and permission of the publishers, Harper & Brothers, holders of the copyright.]

DOGTOOTH VIOLET. One of the earliest of the North American flowers to greet the spring is the dogtooth violet, or adder's-tongue. The plant is really not a violet but belongs to the lily family. The yellow, purplish, or white bell-shaped flower, with its delicate fragrance, is borne on a slender stem from 6 to 12 inches high, between two large flat shining leaves. It is found especially in moist places and along the banks of streams, and hence is sometimes called the "trout lily." The name "dogtooth" refers to the appearance of the bulbs from which the plants spring.

Scientific name of yellow dogtooth violet, *Erythronium americanum*. Leaves pale green mottled with purple; oblong, lance-shaped. Flowers single, rather large; 6 spreading or recurved sepals, 6 stamens, 1 pistil.

DOGWOOD. There are about 40 species of these hard-wooded shrubs and trees, mostly in the temperate regions of the Northern Hemisphere. They all belong to the genus *Cornus*, so named from the Latin word for "horn," on account of the hardness of the wood. The most showy species is the flowering dogwood, which blooms in early spring before the leaves unfold, and is found as far north as New England and westward to Minnesota. Its large "flowers" (really petal-like bracts) of white or pinkish hue make the tree a conspicuous sight in the bare woods. The bark is said to contain a substance similar to quinine. The ordinary brush forms, with red and greenish twigs and white, bluish, or red berries, are common throughout the United States. The European dogwood makes the best charcoal for the manufacture of gunpowder.

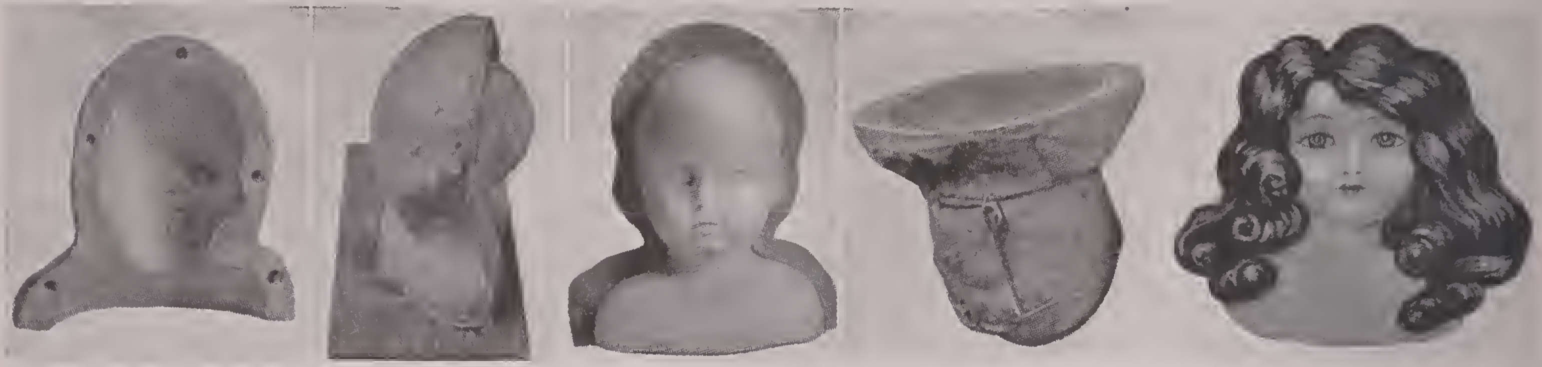
THE DOGWOOD "FLOWER"

The Dogwood tree is among the earliest to bloom in the spring.

Scientific name of flowering dogwood, *Cornus florida*. Bark blackish or dark red-brown, roughly ridged. Leaves simple, opposite, entire and often unequal at sides. Flowers green, tiny, perfect, growing in a rounded central cluster. These are surrounded by a showy ring of white petal-like bracts, usually mistaken for the real flowers. Fruit clustered bright red berries.

DOLLS. Was there ever a little girl who did not like to play with dolls? All over the world millions and millions of children are hugging dolls and talking to them in hundreds of different languages. What an interesting scene it would be if you could get together all of the many kinds of dolls! The little Eskimo girl dandles a rudely carved bit of whalebone with as

HOW SISTER'S DOLL GETS ITS HEAD



The common china doll heads are made in molds divided into two parts so that when the material has hardened the two parts can be separated and the doll's head taken out. The third picture shows how the two halves of the mold are tied together for filling with the clay.

much devotion as the little American girl pets her big and costly wax doll that opens and shuts its eyes and says "mamma." The pickaninny of the South makes a doll of a corn-cob wrapped in a bit of rag, and her far-away cousin in Africa contents herself with a bit of wood with clumsily carved features. In Japan girls play with kimono-clad dollies with black hair and slanted eyes, just like themselves; and in Mexico they have funny-looking dolls of baked clay.

A DOLL FROM EGYPT

Although crude, it satisfied the little Egyptian girl.

It has been the same in all ages. In the British Museum there are dolls more than 3,000 years old, found in tombs of the ancient Egyptians. They have flat bodies of carved and painted wood, and hair of clay beads strung on thread. The dolls of ancient Greece and Rome were an improvement over these, for they have well-shaped heads, and jointed arms and legs that can be moved by means of strings. Yet even so, they are very different from the talking, winking, real-haired dolls you know.

For many years Germany, the Netherlands, and Switzerland made dolls to supply the toy markets of Europe and the Western world. Then England, France, and America began to make dolls for their own markets. In the United States there are large factories that turn out 7,000 heads a day. More and more the dolls today are given heads and features like real children, though "kewpies," "brownies," "billikins," "teddy bears," and other eccentric character dolls are common. Mechanical dolls are frequently made, and unbreakable composition heads are replacing the perishable wax and china ones. Dolls are made of a great variety of materials—the unglazed pottery called bisque, rubber, wood, papier-mâché, etc.

MAKING A REAL "BEAUTY"

Nowadays doll-makers turn out truly wonderful playthings for little girls. Here is a doll-maker shaping a little head that is a real work of art. Many heads will be molded from this model.

DOLPHIN. Every ocean traveler is familiar with the dolphins, the small relatives of the whale, which escort steamers for miles across the sea, apparently delighting to leap from the sea and to exhibit their swimming tricks to human spectators. Probably because of their friendliness, no creatures of the ocean have ever been surrounded with more myth and romance (*see* Arion). It is a sailor's superstition that bad luck will come to anyone who harms one of these sea-clowns, and when the churning propeller of a steamer cuts up an inexperienced young dolphin, the old deck hands shake their heads in warning.

A DOLL OF OLD ROME

It is at least more life-like than its Egyptian relative.

The dolphin is frequently mistaken for the porpoise. The "schools of porpoises" described by many seafarers are in reality dolphins, for the true porpoise seldom ventures far from shore (*see* Porpoise). Unlike the porpoise, the dolphin has a sharp beaklike nose, but otherwise these sea mammals resemble each other closely. The common dolphin is six to eight feet long, and is very dark brown above and white underneath; it feeds upon fish. The tail is flattened horizontally instead of vertically, like a fish's tail, and the dolphin has other peculiarities of the whale family (*see* Whale).

Some species swim up the mouths of rivers, especially in South America. They are not a staple article of food, although seamen occasionally defy superstition and catch a dolphin in order to enjoy the rich oily meat.

The Greeks used the dolphin as a symbol of the sea, and to the early Christians it was a symbol of the dead. The name dolphin is also given to a swift fish of the open sea, which often attains a length of six feet. They are of a brilliant golden-blue with deep blue spots, but the colors fade rapidly when the fish is taken from the water. Scientific name of common dolphin, *Delphinus delphis;* of dolphin-fish, *Coryphoena hippuris.*

DOMESTIC SCIENCE. The name given to a group of subjects, now usually called Home Economics, taught in schools and colleges with a view to preparing girls to be "home-makers." The courses deal with foods and their preparation, textiles and other clothing materials, household sanitation, etc. (*See* Home Economics.)

DOR'MOUSE. This small animal of squirrel-like habits, a native of the Old World, is related to both the mice and the squirrels and is in structure intermediate between them. It lives in trees and bushes, feeding on nuts and berries, and sits erect on its haunches like a squirrel when eating. It lays up a store of food for winter, and when cold weather comes it curls up in its nest and sleeps. On warm days it is likely to wake, eat, and fall asleep again. Its name means "sleeping mouse." Dormice are tamed and kept as pets. In the United States the common white-footed mouse is often called dormouse.

DOUGLAS, STEPHEN ARNOLD (1813–1861). Though a New Englander by birth, having been born at Brandon, Vt., Stephen A. Douglas early identified himself with the new West, and for a time was regarded by the slaveholding South as its most promising champion. At the age of 20 he moved to Illinois and there began the practice of law. Politics soon claimed his attention, and from 1835 until his death he held office, either in the state government or in Congress.

It was in the United States Senate that he won his chief fame as author of the Kansas-Nebraska bill of 1854. This gave popular (or "squatter") sovereignty to these territories,—that is, provided that the people of each should themselves decide whether the territory should come into the Union as a slave or free state. The bill was opposed by the anti-slavery leaders, for however they might differ as to what should be done with slavery where it already existed, they were all opposed to its further spread. Among these was Abraham Lincoln, who in 1858 ran against Douglas for the senatorship from Illinois, basing his campaign largely on the Kansas-Nebraska issue. The series of joint debates in which Lincoln and Douglas engaged attracted the attention of the whole country. Douglas won the prize of the senatorship, but in the debate at Freeport, Ill., he was led to declare that any territory could, by "unfriendly legislation," exclude slavery from its limits. (*See* Lincoln, Abraham.)

This statement so antagonized the South that when the National Democratic Convention met in 1860 the Southern delegates "bolted" rather than support Douglas for president, and named John C. Breckenridge in a separate convention, as their candidate. The Northern Democrats nominated Douglas. The split in the party made the election of Lincoln, the Republican candidate, a foregone conclusion.

Douglas now devoted his energy to opposing secession, and loyally pledged his support to Lincoln and the Union. Unfortunately this valuable work was cut short by his death, less than two months after the beginning of the war. Douglas left a reputation as a formidable debater and resourceful political leader. Because of the contrast of his small body—being barely five feet in height—with his massive head and shoulders, he was known as "the Little Giant."

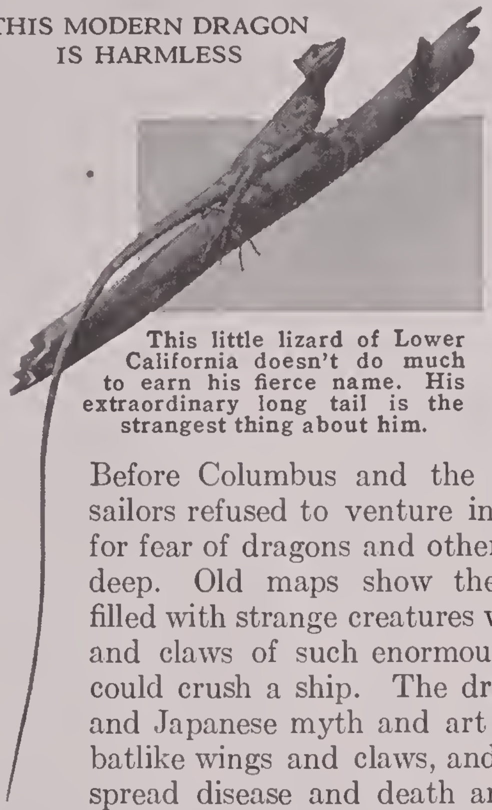
DOVE. A name generally used for the smaller species of the pigeon family, but often applied to any members of that family. The mourning dove, which is often mistaken for the extinct passenger pigeon, is a familiar species. The dainty little ground dove is the smallest North American pigeon. (*See* Pigeons and Doves.)

DOVER, ENGLAND. From the days of the Roman occupation of Britain, Dover has been one of the most important ports on the English Channel, for the opposite coast of France, at Calais, is here only 21 miles away. From the high chalk cliffs which tower nearly 400 feet above the harbor one may get a magnificent view of the French coast from Boulogne to Gravelines.

Evidences of the ancient importance of the site remain in the form of two ruined Roman light-houses which guided mariners nearly 2,000 years ago to the narrow entrance of the little Dour River, along whose valley the city lies. Remains of fortifications erected by the early Saxons and by the Normans under William the Conqueror attest the military significance of the Dover cliffs, which are today honeycombed in all directions by military works. One end of the great submarine defenses which were constructed across the Channel during the World War was at Dover. Its mild climate and splendid scenery make it a favorite health resort. Population, about 44,000.

DRAGON. Long ago, according to a legend of the Middle Ages, there dwelt in a distant pagan land a dreadful monster called a dragon. The flapping of its great batlike wings could be heard for miles around, and with a single blow of its terrible claws it could fell an ox. Its snakelike body was covered with slimy scales and on the tip of its pointed tail was a poisonous sting. From flaring nostrils came clouds of smoke and flame that brought death to those who breathed it.

Every year a young virgin was offered to it to prevent it from rushing upon the city and destroying all the inhabitants. One year the lot fell on Princess Sabra, daughter of the king; but she was saved by the valiant St. George, youngest and bravest of the seven champions of Christendom, who chanced to be riding in this far-off land in search of adventure. With his magic sword Ascalon, he wounded the monster so sorely that the Princess was able to put her sash about its head and lead it, meek as any lamb, to the market-place of the town, where St. George slew it with one blow. Won over to the Christian faith by this deed of its champion, the people were baptized, and the Princess was wedded to her deliverer.



THIS MODERN DRAGON IS HARMLESS

This little lizard of Lower California doesn't do much to earn his fierce name. His extraordinary long tail is the strangest thing about him.

This is but one of the many dragon stories told in the lore of different countries (*see* Perseus; Siegfried).

Before Columbus and the age of discovery sailors refused to venture into unknown seas for fear of dragons and other monsters of the deep. Old maps show the uncharted seas filled with strange creatures with wings, horns, and claws of such enormous size that they could crush a ship. The dragons of Chinese and Japanese myth and art are reptiles with batlike wings and claws, and are supposed to spread disease and death among the people. Sacrifices are still made to appease their wrath. For ages the dragon was the emblem of the former imperial house of China. That these superstitions have a basis of fact is perhaps indicated by the discovery of fossil skeletons of mammoth reptiles that roamed the prehistoric world. Although the most terrifying beasts of prehistoric times, such as the Dinosaurs, lived in the ages before man had appeared on earth, there may have been some surviving reptiles of great size in the time of the primitive cavemen of Europe. Such beasts would easily give rise to legends of monsters such as the dragons. (*See* Animals, Prehistoric.)

In the East Indies certain small lizards, seven or eight inches long, are known as "dragons." They are about the color of tree bark, and the skin along their sides between the legs spreads out into a kind of parachute, enabling them to fly among the branches of the trees in which they live. There are about 20 species, all harmless.

DRAGON-FLY. Some fine summer day, if you are lucky, you may see a thick clumsy-looking insect, built something like a grasshopper, crawl out of the water of a pond and wearily make its way up the stalk of a plant. Presently you will see its muddy coat split down the back; and slowly and painfully there crawls out a light and slender creature, too weak to open its wet wings. But when it has warmed itself in the sun long enough, and its wings have expanded into long delicate cobwebby structures and dried, it suddenly takes flight—and lo! one more gorgeous dragon-fly has been born. Tennyson has beautifully described this constantly repeated miracle of nature in his often-quoted lines—

> Today I saw the dragon-fly
> Come from the wells where he did lie.
> An inner impulse rent the veil
> Of his old husk; from head to tail
> Came out clear plates of sapphire mail.
> He dried his wings; like gauze they grew;
> Thro' crofts and pastures wet with dew
> A living flash of light he flew.

Ignorant people fear these quick-darting gems of the air, and have wrongly imagined that they do mischief to men and animals. They give them such names as "snake-feeders," "horse-stingers," and "devil's darning-needles," and tell children to be careful or they will sew up their ears. This is a great mistake. Dragon-flies, so far from harming men, are very useful friends to him, for they are tremendous hunters and destroy myriads of mosquitoes, flies, and other injurious insects. Dragon-flies are the terrors of the insect world. They have two marvelous compound eyes that are each really 20,000 or 25,000 tiny eyes joined to make one great organ of sight, so that they can see their prey distinctly; and they have very powerful wings that propel them through the air with the speed of an express train. So it is a very nimble or a very lucky insect that escapes if it gets into the neighborhood of a hungry dragon-fly.

There are two large groups of dragon-flies, the dragon-flies proper which keep their wings outspread when they alight—which isn't often, for they seem tireless—and the slenderer bodied damsel-flies which fold their wings down their darning-needle backs, in the shyest way, as if they didn't want to be noticed. Their name comes from the French *demoiselle*, which means "young lady." One of the damsel-flies is so gray and modest that it is called "marsh nun."

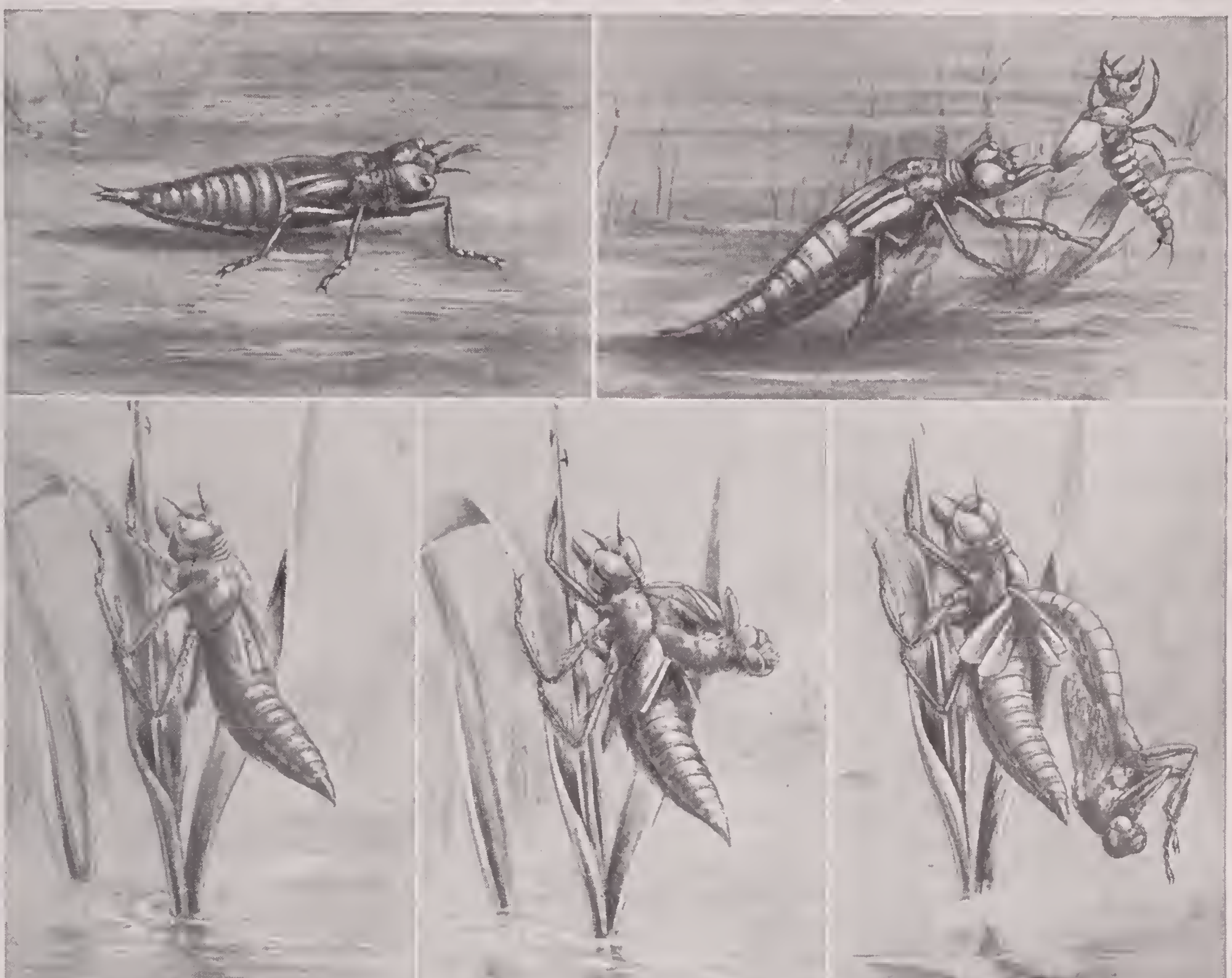
They all have very long slender stiff bodies of dazzling colors, in steel blue, purple, green bronze, copper, and silver white. Their four long narrow silver-gauze wings are beautifully veined, and are often spotted with white or brown or amber. Their big jewel eyes stand out and glitter like lamps, and they have regular snapping-turtle mouths.

A FIERCE INSECT DRAGON

The Dragon-Fly deserves his name, for he preys hungrily on other insects.

On very hot midsummer days there often seems to be nothing on the wing but these glitter-winged dragons of the air, and their swarms of little victims.

HOW THE WATER "DRAGON" GETS ITS WINGS



Who would suppose that the wingless creature crawling along the bottom of a pond in the upper left-hand picture was any relative of the beautiful Dragon-Fly? Yet it is a dragon-fly nymph. The picture in the upper right-hand corner shows it seizing another insect for food. When the creature has grown sufficiently, it crawls up a stem into the air, and climbs out of its old skin, as shown in the next four pictures. The next to the last picture shows it drying its wings and gathering strength, and the last shows its start in life as a full-fledged Dragon-Fly.

Some of them scurry to shelter in the water weeds if a cloud blows up, but others love to frolic with the wind, and will even go out over white-capped waves. If food is scarce on the water, some of them will go up into meadows and orchards and get a lunch of codlin moths and weevils. One species, the green-bodied damsel-fly, even ventures onto lawns, and eats house-flies and mosquitoes there.

Dragon-flies live part of their lives in the water and part on land. The eggs are laid in the water, and the young (called "nymphs") live there two or three years until they change to the adult fly. These nymphs are just as ferocious in the water as the dragon-flies are in the air. They feed upon small water insects, and even very small fish. The underlip is jointed and very long, and bears at its tip a strong pincer. With this they reach out, grasp the food, and convey it to the mouth. When not in use this lip is folded back underneath the head. They breathe by sucking water into the lower part of the body, where the oxygen is extracted by many little tubes. The water is forced out again, at the same time sending the nymph darting through the water in a series of jerks.

Dragon-flies are members of the order *Odonata*. Among the most abundant of the dragon-flies proper are the banded (*Libellula semifasciate*) and the basal (*Libellula basalis*). Common species of the damsel-flies are the green-bodied (*Lestes eurina*) and the red-spotted (*Hetaerina americana*).

DRAKE, SIR FRANCIS (1540?–1596). Most celebrated of the English "sea dogs" of Elizabeth's reign, Drake was the first Englishman to sail around the globe and he took a leading part in defeating the Great Armada gathered by Spain to invade England. To his countrymen he was a hero for whose fame "the ocean sea was not sufficient room," while in the eyes of the Spanish he was a devil incarnate.

Born in Devonshire, in the west of England, Drake grew up in a sea-faring atmosphere. While still a lad he shipped as apprentice on a coasting vessel, and at the age of 20 he accompanied his cousin, the famous Sir John Hawkins, on a slaving voyage to Guinea. Two years later he commanded a ship on another voyage, in the course of which the Englishmen were attacked in the port of Vera Cruz and lost all but two of their vessels. This disaster cost Drake nearly everything he possessed and he determined to devote the remainder of his life to a relentless war against Spain and her American possessions.

Obtaining a privateering commission from Queen Elizabeth, Drake gathered a band of adventurers together and made three successful voyages to the New World. He plundered several Spanish settlements, destroyed many of their ships, and made a daring march across the Isthmus of Panama. By climbing a high tree, he there caught his first glimpse of the Pacific. His prayer that he "might navigate those waters in an English ship" was answered on his famous voyage around the world (1577–80).

WHEN DRAKE FIRST SAW THE PACIFIC

Sir Francis Drake's first glimpse of the Pacific was when he climbed a tree in which his Indian guide had cut steps for him. When he saw it, Drake prayed to God that he might "sail once in an English ship on that sea."

On this great voyage he set out with five vessels, intending to pass through the Straits of Magellan and explore the waters he had seen from the Isthmus of Panama. When the Straits were passed, Drake's ship pushed on alone, the other vessels having either turned back or been lost. Up the coast he went, plundering the Spanish settlements in Chile and Peru, and capturing unsuspecting treasure ships bound for Panama to transship their cargoes. A Spanish captain, captured and later released, gives us this glimpse of Drake and of life aboard his ship, the *Golden Hind*, in a letter which he wrote:

"He (Drake) is about 35 years old, of small size, with a reddish beard, and is one of the greatest sailors that exist, both from his skill and his power of commanding. He has with him nine or ten gentlemen, younger sons of the leading men in England who form his council. He has, too, all possible luxuries, even to perfumes, many of which he told me were given him by the Queen. None of his gentlemen sits down or puts on his hat in his presence without repeated permission. He dines and sups to the music of violins. He has two draughtsmen who portray the coast in its own colors, so naturally that anyone following him will have no difficulty."

Drake sailed northward and claimed the California coast in the name of his Queen. To avoid braving the outraged Spaniards by returning the way he had come, he determined to emulate Magellan and return home by making a circuit of the globe. So he crossed the Pacific and Indian oceans, sailed around the Cape of Good Hope, and reached England in November 1580, nearly three years after he had set out. (For map showing route, *see* Magellan.) The magnitude of Drake's achievement and the courage which he displayed amply merited the acclaim which greeted him. Elizabeth shared richly in the treasure he brought, and honored him by dining on board his ship and raising him to knighthood, although she knew that this would infuriate the Spanish, already roused to a white heat of rage by Drake's exploits in American waters.

In the war with Spain which soon after broke out (1585), Drake won his crowning honors. After once more carrying death and destruction to the Spanish settlements in the West Indies, he led a daring expedition into the port of Cadiz in Spain itself. Here he destroyed so many vessels that the great expedition which was being prepared for the invasion of England was delayed for a whole year. After thus "singeing the king of Spain's beard" Drake returned home in triumph. When the great Spanish Armada finally did come sailing up the English Channel (1588) Drake as vice-admiral of the English fleet played a chief part in the running fight of a week which drove off the Spaniards (*see* Armada, Spanish). During this fight Drake encountered a fine galleon commanded by Don Pedro de Valdez. So great was the terror of the Spaniards that the vessel surrendered at once, upon learning that Drake was their opponent. The circumstance was particularly interesting because Pedro de Valdez is supposed to have been one of the leading promoters of the idea of despatching the Armada and invading England.

Some eight years later, on a final expedition against the Spaniards in the West Indies, Drake was taken ill and died. Perhaps more than any other he had helped to break down the commercial and maritime supremacy of Spain, and to set England on the way to becoming Mistress of the Seas.

TWENTY-FIVE CENTURIES *of the* DRAMA

ALL children and primitive peoples love to "make believe." The small boy pretends he is a mighty hunter and acts out an elaborate pantomime of stalking and bringing down the beasts of the forest. The girl "plays house" with her dolls and dramatizes the life she sees around her. So primitive man had mimic dances and pantomimes, in which he lived over and over again the most vivid and momentous incidents of his experience. These "make believe" games and pantomimes are the raw material out of which drama is made. Though the dramatic instinct is so deeply rooted in human nature that it manifests itself in some form in every people, no matter how low in civilization, yet of all ancient peoples only the Greeks had the genius to develop these germs of drama and bring them to splendid flower. In this article we see how the drama which delights us today grew in the course of 2,500 years from its Greek beginnings.

DRAMA. Like most other primitive folk, the Greeks early in their history had feasts to celebrate the two most important events of the year, the harvest and the springtime—the time of plenty and the time of promise. At these festivals they did honor to Dionysus (Bacchus), the god of the vineyard, of trees and plants and fruitfulness. They worshiped him with song and dance and sacrifice, and gradually the wild processions and impromptu chants became more or less fixed in form. At the vintage-festival in the winter, bands of revelers marched riotously through the village chanting their rude choruses. In the intervals between the songs the leader of the procession would exchange jests and banterings with members of the company or with the leaders of rival bands. The most striking of these dialogues would be treasured in memory to be repeated the following year, until gradually they crystallized into genuine drama—the representation of a complete story by words and action. From these rude dialogues grew Greek comedy, so called from the Greek words *komos* (revel) and *ode* (song).

The Birth of Tragedy

The spring festivals took a different turn. At these times it early became the custom to tell in song and dance the chief episodes in the life of the god they were worshiping. Dressed in goat-skins to represent the satyrs—being half goat, half man, who attended Dionysus—they would dance around the smoking altar, reciting the god's adventures. From this humble beginning sprang Greek tragedy, a creation of human genius which for moral grandeur, dramatic power, and artistic perfection is equaled only by the greatest works of Shakespeare. Tragedy gets its name from the goat-skins worn by the chorus, being formed from the Greek words *tragos* (goat) and *ode* (song).

GREEK ACTORS AND THEIR "FALSE FACES"

This picture, from a painting by the French artist, Jean Léon Gerôme, shows a group of Greek actors in the dressing room of their theater. One of them is holding before his face a tragic mask, as much as to say: "How would I do in tragedy?" Greek actors used to wear huge masks, representing the general character of the part they were playing. For comic rôles the masks were as grotesque as possible. The mouth openings were always large, to permit the voice to issue freely.

It is easy to see how in course of time the leader of the chorus would introduce passages of lively dialogue with the chorus, to amplify and explain the narrative given in the choral odes. To arrive at genuine drama, one step remained to be taken. Semi-dramatic narration must give way to actual impersonation of the god and those who shared in his adventures. This step was taken about the beginning of the 6th century B.C. by Thespis, who is traditionally known as the father of Greek tragedy. His innovation consisted in picking out a member of the chorus to play in turn the parts of all the prominent figures in the legend. This was the birth of true drama. Gradually the dialogues and choruses, at first hit off on the spur of the moment, took literary form. They were carefully worked out before the performance and committed to memory by actor and chorus.

Thus the way was opened for the immortal trio—Aeschylus, Sophocles, and Euripides—who established the drama as one of the noblest forms of literary art, and left the magnificent body of plays from which have sprung all later dramatic literature worthy of the name. Each of these great men further unfolded the resources of the art.

Aeschylus introduced a second actor, thus making it possible to throw all the central incidents of a story into dramatic form. He invented a special costume for these actors, raising their stature by thick wooden soles, clothing them in rich robes, and equipping them with awe-inspiring masks, to lend to them the superhuman dignity befitting the great legendary characters they impersonated. Sophocles went a step further in introducing a third actor and giving the chorus a place of less importance. He thus heightened the dramatic interest. Euripides' great contribution was to "bring drama down from the skies." His predecessors represented the heroes, gods, and great legendary characters in more than life size. Euripides was the first realist in the drama, for he was content to paint men and women as they were, with all their defects and vices. He stripped the veil of idealism from the drama and humanized it, thus opening the way for Shakespeare and the other giants of modern drama.

How Comedy Sprang Up

Parallel with the development of tragedy went on the growth of comedy. From the jesting dialogues of the vintage-festival grew burlesques and parodies, plentifully interspersed with broad jokes directed against the men and fashions of the day. This is the character of Greek comedy as we see it in the plays of Aristophanes, who made it the vehicle of satires and burlesques against the Athenians of his time. Thus he ridiculed the philosopher Socrates in 'The Clouds'; and in 'The Frogs' he directed his keen-edged wit against his fellow-dramatist Euripides. Menander, the second great comic dramatist of the Greeks, whose work is known to us only in fragments and Latin adaptations, refined and elaborated the comedy form, and molded it into something like the shape we have in the modern comedy of manners.

A SCENE FROM A MEDIEVAL PLAY

The great dramatic entertainments of the Middle Ages were the Mysteries and Miracle Plays, in which incidents from religious history were presented. Each group of actors had its own "pageant" or movable stage, which was wheeled from street to street while the various scenes were given over and over again until the whole series of scenes had been played at each stopping-place.

So great were the achievements of the Greek dramatists that the Romans could only follow in their footsteps. Their chief writers of comedy, Plautus and Terence, and their one great tragic poet, Seneca, did little but imitate the Greek models. Even the scenes of Roman comedy were laid in Athens, and the characters had Greek names.

Both Plautus and Terence found their chief inspiration in Menander. Terence was content to translate or at the most adapt Menander's comedies. Plautus, aiming at a lower type of audience, dealt more freely with his originals and made his supposedly Athenian characters act and talk like the Romans of his own day. Thus he left for us invaluable pictures of "low life" in Rome.

Among the later Romans drama ran an inglorious course. The mixed populace of that time—the dregs of the vast Roman empire—had little mind to the severity of tragedy or the delicate fancy of comedy. They preferred the bloody fights of gladiators and combats with wild beasts in the arena, and the lewd buffoonery of the variety entertainment which they called the *mime*. So the influence of the rising Christian church was naturally thrown against the stage and all its works. The theater was condemned and accursed, and dramatic literature passed from view for nearly a thousand years.

Drama in the Middle Ages

Human nature, however, remained the same. Deprived of the great body of classical drama, the people of the Middle Ages began the tedious process of developing a drama all over again. There were two main lines of development. The harvest and spring time again were the inspiration of seasonal festivals, village games, and dances. The may-pole dance, which is still to be seen in rural England, is a survival of these sports on the village green.

But the chief source of inspiration was again religion, as it was in Greece. Drama was employed in the church service itself at Easter and Christmas, to bring home in concrete form the birth and the resurrection of Christ. Little plays, dialogues, and pantomimes were devised to represent these and other incidents in the life of Christ.

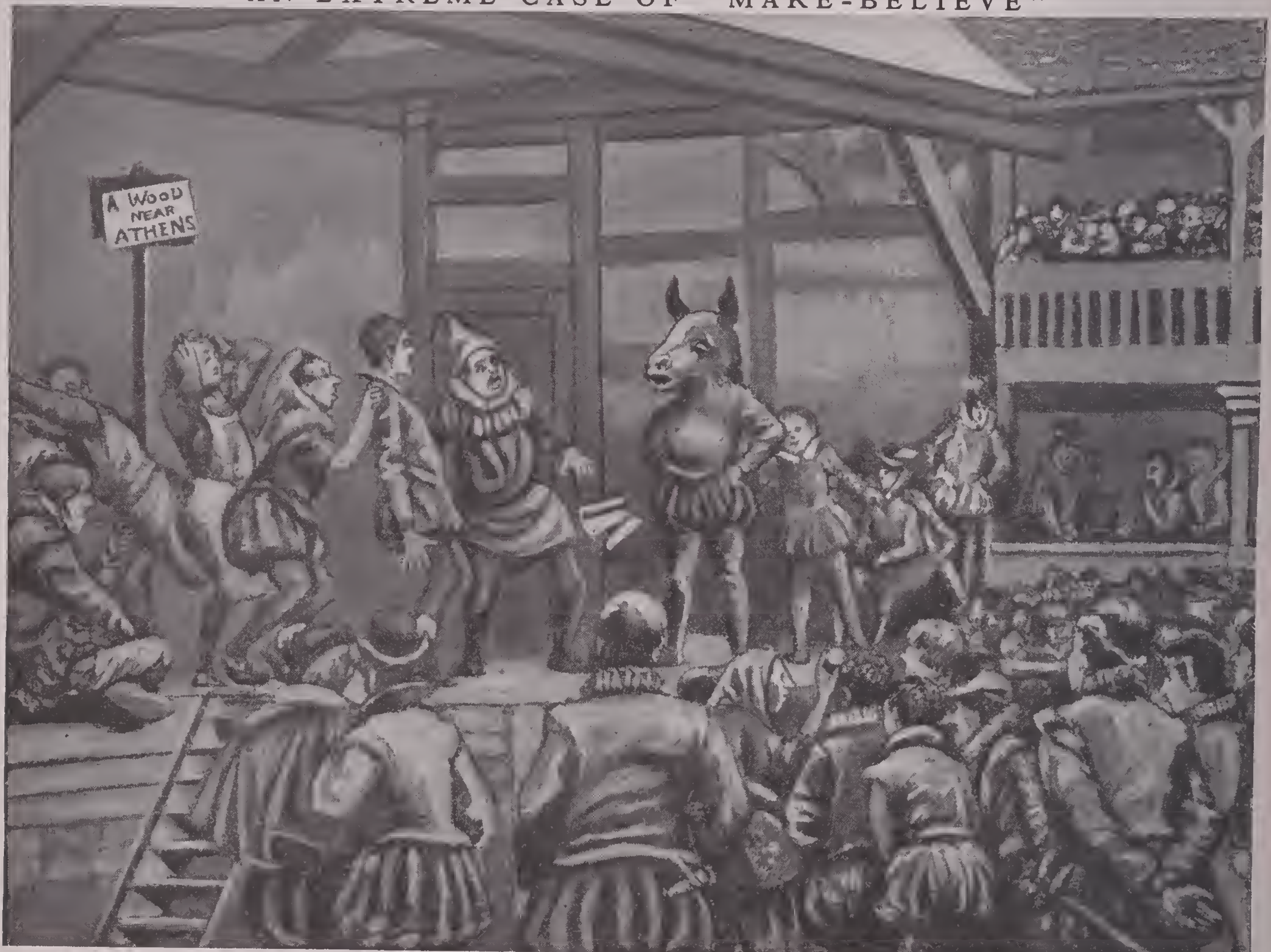
The new dramatic art flourished throughout Europe, but reached its greatest development in England. After a time the plays grew to such length that it was found inconvenient to include them in the regular service. Other Bible stories were added, with legends of the saints, and the performances were transferred to the churchyard and given in series. One play led to another until these "Mysteries" and "Miracle plays," as they were called, expanded to long cycles. The York Cycle includes 48 separate plays. Though the subject was always religious, the treatment often became broadly farcical, as in the celebrated scene in which Noah's wife has to be shoved into the ark.

As the plays became more elaborate the church gilds and the gild organizations of artisans assisted in the performances, and gradually took them over altogether. Each gild would make itself responsible for a particular episode and construct a float, consisting of a dressing room below and a stage above. On church festival days this float was dragged through the streets, halting at fixed points while the episode was given, over and over again, to the various companies of spectators. The costuming was often costly and realistic; devils were dressed in yellow and black to suggest the fires of hell. These Miracle plays continued to be very popular during the later 14th and throughout the 15th century. By 1550, however, their vogue had passed and they were rarely given. (*See* Miracle Plays.)

Along with these plays grew up another group—the moralities. Instead of using biblical and legendary characters for heroes and villains, they personified vices and virtues such as Hypocrisy, Heresy, Piety, Justice, Peace, and Truth. One of these plays, called 'Everyman', was recently revived and put on the stage with enormous success.

Into this crude, formless, artless folk-drama the Renaissance, or rebirth of classical learning, suddenly introduced a new inspiration. In the libraries of the monasteries, which were the only considerable storehouses of learning, scholars were beginning to find the old Greek and Roman classics. The union of classical models with the subject-matter of the day produced the beginnings of modern drama.

AN EXTREME CASE OF "MAKE-BELIEVE"

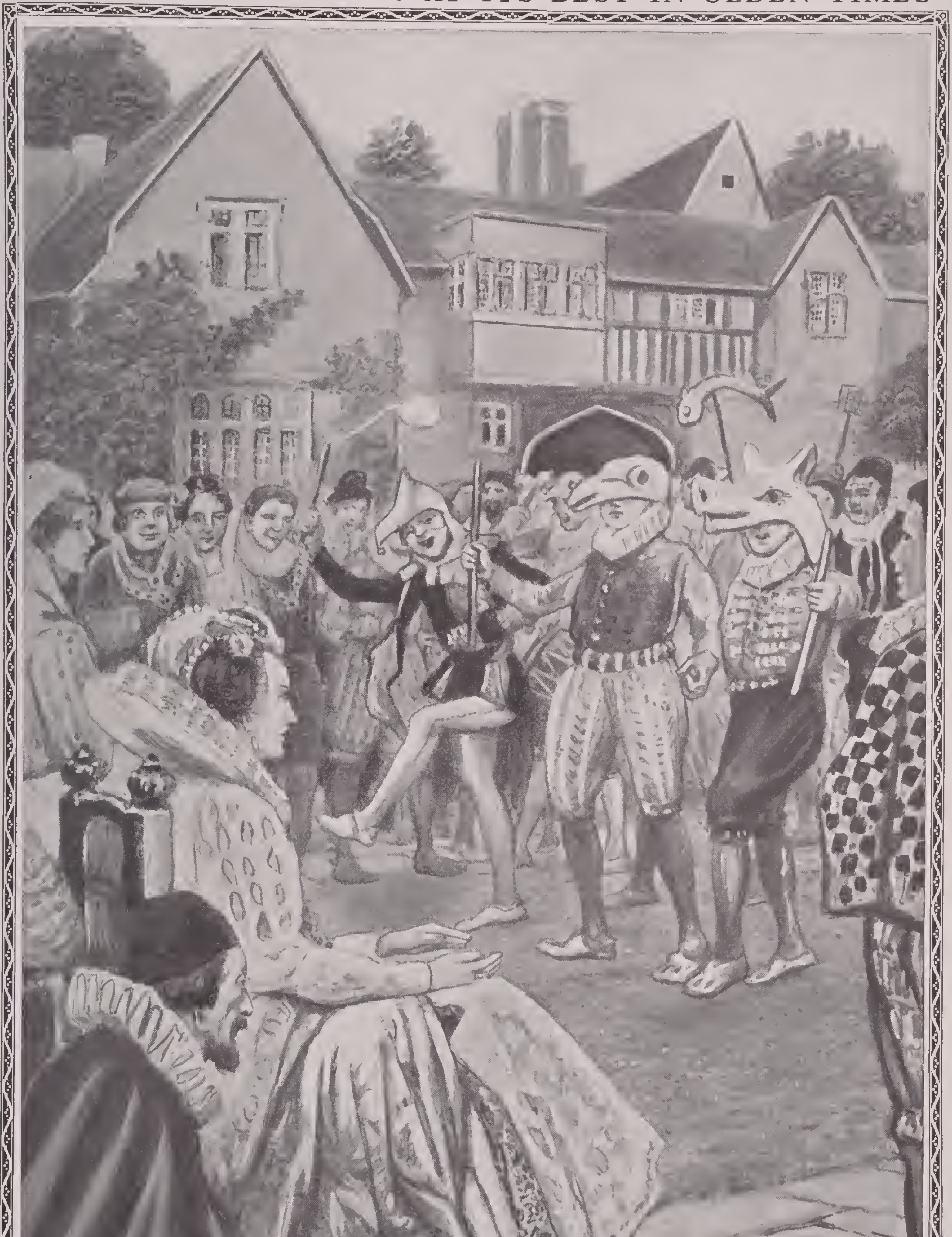


In Shakespeare's day performances were often given in the open courtyards of inns, or in rude theaters built on the same model. There was no scenery, and changes of scene were represented by sticking up placards telling where the action was supposed to take place. Here, for instance, is an amusing moment in Shakespeare's 'Midsummer Night's Dream'. It is supposed to take place in "a wood near Athens." But you would never know it, if there were not a sign to tell you so. Most of the audience had to stand during the whole performance.

France, England, and Spain soon developed a vigorous national drama. In Germany, which was divided into small autocratic principalities and city-states and was distracted by religious wars, national ideals were weakening through princely imitations of everything French, and there the drama developed late. Her great dramatists, Schiller and Lessing, belong to the 18th century. In England, Marlowe, Ben Jonson, and Shakespeare; in France, Corneille, Racine, and Molière; in Spain, Lope de Vega and Calderon—these are the names that will long endure.

Shakespeare heads the illustrious list. He was the matchless genius, who took the best from all ages and fused it into living, breathing, dramatic art. What Shakespeare did for tragedy and romantic comedy, the great Molière did for the comedy of manners.

After Shakespeare the English theater declined rapidly. There are many scenes of beauty and power in the plays of Beaumont and Fletcher, Massinger, Ford, Middleton, Webster, and others, but all these men fell far below their great predecessor in artistic and moral genius. In one line alone was there progress—in the comedy of manners, satirizing contemporary fads and follies. The opposition of the Puritans to the theater, already pronounced, was deepened into bitter hostility by the merciless satire which the dramatists directed against them. Finally in 1642, immediately after the outbreak of the Civil War, the Puritans closed the theaters and Parliament ordered that all stage-players be treated as rogues.



Here we see Queen Elizabeth attending a pageant given in her honor. Such pageants, particularly those produced at Kenilworth Castle, were often very splendid affairs. Here we see an amusing scene representing the animal kingdom—beasts, birds, and fish—with a clown to pass merry quips.

On the restoration of the licentious Charles II, there was a wild reaction from Puritanism to unrestrained sensuality, both in court and society and on the stage. Comic writers of genuine power, wit, and brilliance—Dryden, Congreve, Wycherley, Farquhar, Vanbrugh, and their contemporaries—poured out a flood of clever immoralities, that were brought to an end by the reawakened conscience of the people and the thunders of the famous pulpit orator, Jeremy Collier. From that day to the present the breach between the theater and the Puritan spirit has remained, though the revival of genuine literary drama in the last two generations has done much to bridge the gulf.

During the 18th century no new plays of lasting value were brought out on the English stage until the time of Sheridan and Goldsmith. Then comedy once more lifted its head, but chastened and purified. It no longer offended good taste or morals and had brilliance of dialogue as well as clever characters and situations. Goldsmith's 'She Stoops to Conquer' and Sheridan's 'The Rivals' and 'The School for Scandal' are still seen on the modern stage.

The poets of the Romantic Period, which usually is dated from the appearance of 'The Lyrical Ballads' of Wordsworth and Coleridge in 1798, were not interested in drama except in a literary sense. Their plays never made a popular appeal nor were they intended to do so. The real awakening of the stage came in the latter half of the 19th century.

That awakening was due to a number of reasons. As a whole the century following the French Revolution was a struggle toward democracy in the face of dogged opposition by reactionary governments and aristocracies. The great Industrial Revolution brought new social problems. Inventions, easier communication, discoveries of science, new philosophies, and the breakdown of the old accepted ideas brought a rebirth of thought and art which found expression in the modern social drama.

Ibsen and the Drama of Protest

The father of the new drama of protest and social criticism is Henrik Ibsen. His fearless assaults on the hypocrisy and abuses of modern society and his simple and trenchant technique have been the inspiration of playwrights all over the world.

The same ideas that interested Ibsen influenced George Bernard Shaw and Galsworthy in England, Brieux in France, Hauptmann and Sudermann in Germany, Strindberg in Scandinavia, Gorky in Russia, and scores of others to write powerful plays.

THE CREATOR OF "PETER PAN"

Few modern plays have had such lasting success as 'Peter Pan'. Here we see Maude Adams in the costume of the famous part.

At the same time poetry and romance reclaimed their rightful place on the stage. The romantic writers also felt the burden of the times, but their reaction was different. They turned to the consolations and the fine distinctions of the spirit; the individual interested them rather than society as a whole. Rostand in France wrote 'Cyrano de Bergerac', 'L'Aiglon', and 'Chantecler', dramas charming for their spirit and poetic feeling. Sir James Barrie in England delighted the world with the delicate sentiment of 'Quality Street' and 'Peter Pan', Hauptmann in Germany wrote 'The Sunken Bell', Maeterlinck, the Belgian dramatist, wrote 'The Blue Bird' and 'The Blind'. Some of these plays delight even children by their fairy atmosphere, yet they are deeply symbolic, and, in their way, are just as much a criticism of society as the works of social realists.

A movement toward beauty for beauty's sake also played its part in the revival of dramatic art. Theaters were organized in Russia, Germany, England, and America which aimed primarily at beautiful effects of picture and pageant.

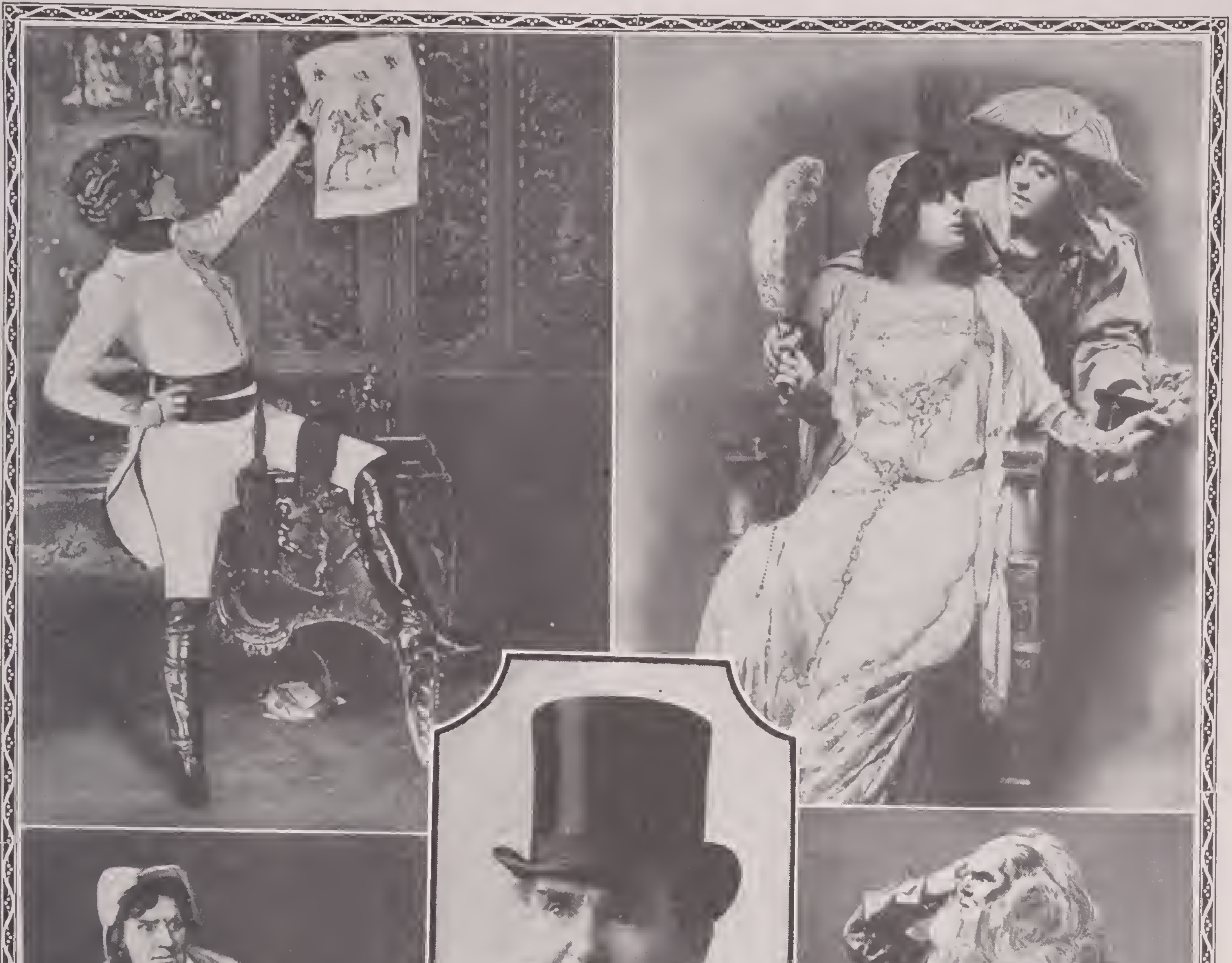
The Drama of Everyday Life

Throughout the whole century there was an attempt, conscious or unconscious, to bring the drama into closer touch with life by making the characters everyday people. The Irish Literary Revival exhibited this tendency to a marked degree. Synge and Yeats went to the Irish peasant, with his innate poetry and wit, for their dramatic material, and for the first time in literary history portrayed the Irishman as he is. The influence of this Irish Revival, with its revolt against the artificiality and commercialism of the professional theater, has been felt across the Atlantic, notably in the "little theaters," which have sprung up in the large cities of the United States.

The rapid progress of the Continental stage in the last few decades may be attributed in large measure to the existence of the state-endowed theater, which made playwright and producer independent of financial success. Both may strive for perfection in their art, free from the handicap of commercial considerations; and the classics of the stage may be presented far more frequently than is possible in other countries.

In the United States dramatic art has had to get along without this convenient aid. Nevertheless a powerful impulse has asserted itself in the last generation for the creation of a genuine native drama, neither slavishly imitating the work of the great men of Europe nor yet blindly provincial. Plays of real merit are yet few, but promising

FAMOUS PLAYERS OF THE MODERN STAGE



Written large in the history of modern dramatic art are the names of the actors and actresses shown above. In the upper left-hand corner is Sarah Bernhardt, the great French actress, in a scene from 'L'Aiglon'. The upper right-hand corner shows E. H. Sothern and Julia Marlowe as 'Romeo and Juliet'. In the center is the best-loved of all American actors, Joseph Jefferson. The lower pictures show him as Rip Van Winkle—the left-hand one as he encounters the little man with the keg, and the other after his twenty-year sleep.

GREAT NAMES IN THE HISTORY OF THE DRAMA

GREEK

Aeschylus (525–456 B.C.)—'Prometheus Bound'; 'Agamemnon'; 'Choëphori'; 'Eumenides'.

Sophocles (496–406 B.C.)—'Antigone'; 'Oedipus Tyrannus'; 'Ajax'.

Euripides (480–406 B.C.)—'Alcestis'; 'Medea'; 'Bacchae'; 'Iphigenia Taurica'.

Aristophanes (about 448–385 B.C.)—'The Knights'; 'The Clouds'; 'The Frogs'; 'The Birds'.

ROMAN

Plautus (254–184 B.C.)—'Amphitruo'; 'Captivi' (The Captives); 'Aulularia' (The Pot of Gold).

Terence (about 185–159 B.C.)—'Andria'; 'Heauton Timorumenos' (The Self–Tormentor); 'Phormio'.

Seneca (4 B.C.–65 A.D.)—'Hercules Furens'; 'Phaedra'.

ENGLISH

Christopher Marlowe (1554–1593)—'Tamburlaine'; 'Doctor Faustus'; 'The Jew of Malta'.

William Shakespeare (1564–1616)—'Julius Caesar'; 'Macbeth'; 'Twelfth Night'; The Tempest'.

Ben Jonson(1573–1637)—'Every Man in His Humour'; 'The Alchemist'; 'Volpone, or the Fox'.

Francis Beaumont (1586?–1616) and John Fletcher (1579–1625)—'Philaster'; 'The Maid's Tragedy'.

John Webster (flourished about 1602–1624)—'The Duchess of Malfi'; 'The White Devil'.

Philip Massinger (1584–1640)—'A New Way to Pay Old Debts'.

John Dryden (1631–1700)—'All for Love'; 'Antony and Cleopatra'; 'The Spanish Friar'.

Oliver Goldsmith (1728–1774)—'She Stoops to Conquer'; 'The Good–Natured Man'.

Richard Brinsley Sheridan (1751-1816)—'The Rivals'; 'The School for Scandal'.

Henry Arthur Jones (1851–)—'Michael and His Lost Angel'; 'The Hypocrites'; 'The Liars'.

Arthur Wing Pinero (1855–)—'The Second Mrs. Tanqueray'; 'His House in Order'; 'Mid-Channel'.

Oscar Wilde (1856–1900)—'Lady Windermere's Fan'; 'A Woman of No Importance'; 'The Ideal Husband'.

George Bernard Shaw (1856–) — 'Widowers' Houses'; 'Man and Superman'; 'Candida'; 'Pygmalion'.

James Matthew Barrie (1860–)—'Peter Pan'; 'The Admirable Crichton'; 'Quality Street'.

John Galsworthy (1867–)—'The Silver Box'; 'Strife'; 'Justice'.

IRISH (CELTIC LITERARY REVIVAL)

William Butler Yeats (1865–)—'Cathleen ni Hoolihan'; 'The Hour Glass'; 'The Pot of Broth'.

John Millington Synge (1871–1909)—'Riders to the Sea'; 'The Playboy of the Western World'.

AMERICAN

James A. Herne (1840–1901)—'Shore Acres'.

Bronson Howard (1842–1908)—'The Henrietta'; 'Shenandoah'.

William Gillette (1855–)—'Secret Service'.

Augustus Thomas (1859–)—'The Witching Hour'; 'Arizona'; 'As a Man Thinks'.

Clyde Fitch (1865–1909)—'The Climbers'; 'The Truth'; 'The Girl with the Green Eyes'.

William Vaughan Moody (1869–1910)—'The Great Divide'; 'The Faith Healer'.

Eugene Walter (1874–)—'Paid in Full'; 'The Easiest Way'.

Percy Mackaye (1875–) — 'The Scarecrow'; 'Jeanne d'Arc'; 'Tomorrow'.

Edward Sheldon (1886–)—'Salvation Nell'; 'Romance'.

David Belasco (1859–)—'The Girl of the Golden West'; 'The Return of Peter Grimm'.

FRENCH

Pierre Corneille (1606–1684)—'Le Cid'; 'Médée'; 'Polyeucte'; 'Oedipe'.

Jean Racine (1639–1699)—'Thébaïde'; 'Bérénice'; 'Phèdre'; 'Iphigénie'.

Molière (Jean–Baptiste Poquelin) (1622–1673)—'Tartuffe'; 'L'Avare' (The Miser); 'Le Bourgeois gentilhomme' (The Tradesman Turned Gentleman).

Pierre Augustin Caron de Beaumarchais (1732–1799)—'Le Barbier de Séville'; 'Le Mariage de Figaro'.

Alexandre Dumas, the younger (1824–1895)—'La Dame aux Camélias (The Lady of the Camellias).

Victorien Sardou (1831–1908)—'Fédora'; 'Madame Sans–Gêne'; 'La Tosca'.

Eugène Brieux (1858–)—'Blanchette'; 'La Robe rouge' (The Red Robe).

Edmond Rostand (1869–)—'Cyrano de Bergerac'; 'L'Aiglon'; 'Chantecler'.

GERMAN

Gotthold Ephraim Lessing (1729–1781)—'Minna von Barnhelm'; 'Nathan der Weise' (Nathan the Wise).

Johann Wolfgang Goethe (1749–1832)—'Faust'; 'Egmont'; 'Torquato Tasso'; 'Iphigenie auf Tauris'.

Johann Christoph Friedrich Schiller (1759–1805)—'Maria Stuart'; 'Wallenstein'; 'Wilhelm Tell'.

Hermann Sudermann (1857–)—'Die Ehre' (Honor); 'Heimat' (Home).

Gerhardt Hauptmann (1862–)—'Die Weber' (The Weavers); 'Die versunkene Glocke' (The Sunken Bell).

SCANDINAVIAN

Henrik Ibsen (1828–1906)—'The Pillars of Society'; 'A Doll's House'; 'Peer Gynt'; 'Brand'.

Björnstjerne Björnson (1832–1910)—'The Gauntlet'; 'Beyond Our Power'.

August Strindberg (1849–1912)—'Master Olof'; 'The Father'; 'Lucky Pehr'.

SPANISH

Lope de Vega Carpio (1562–1635)—'Los Ramilletes de Madrid' (The Sword of Madrid); 'La Estrella de Sevilla ' (The Star of Seville).

Pedro Calderón de la Barca (1600–1681)—'El Mágico prodigioso' (The Wonder-Working Magician); 'La Vida es sueño' (Life is a Dream).

José Echegaray (1833–1916)—'Mariana'; 'El gran Galeoto'; 'El Hijo de Don Juan' (The Son of Don Juan).

Jacinto Benavente y Martínez (1866–)—'La Malquerida' (The Passion Flower); 'Princess Bebé'.

ITALIAN

Vittorio Alfieri (1749–1803)—'Merope'; 'Virginia'; 'Saul'; 'Mirra'.

Gabriele D'Annunzio (1864–)—'La Giaconda'; 'Francesca da Rimini'.

RUSSIAN

Anton Pavlovitch Chekhof (1860–1904)—'Uncle Vania'; 'The Cherry Orchard'.

Maxim Gorky (1868–)—'At the Depths'; 'The Children of the Sun'; 'The Barbarians'.

Leonid Andréef (1871–1919)—'Anathema'; 'King Hunger'.

BELGIAN

Maurice Maeterlinck (1862–)—'Pelléas et Mélisande'; 'Monna Vanna'; 'Les Aveugles' (The Blind); 'L'Oiseau bleu' (The Blue Bird).

beginnings have been made by a number of vigorous and original minds.

But America's greatest contribution to dramatic art is the creation of a new form, the motion picture. From the humblest beginnings within the present generation, this new art form, capable of splendidly dramatic results, has far outstripped the spoken drama in popularity and wide diffusion. Millions of people depend on the motion picture almost exclusively for their contact with the drama. Its cheapness has made some of the pleasures and benefits of dramatic art available to thousands of communities where formerly drama was unknown, because of the expensiveness of present-day production.

In recent years an attempt has been made to revive the old time puppet show, in which puppets worked by strings or wires are made to pantomime a dialogue carried on by the person operating the figures. But instead of the crude Punch and Judy pantomime, these "marionette theaters" present plays constructed with all the skill of modern dramatic art.

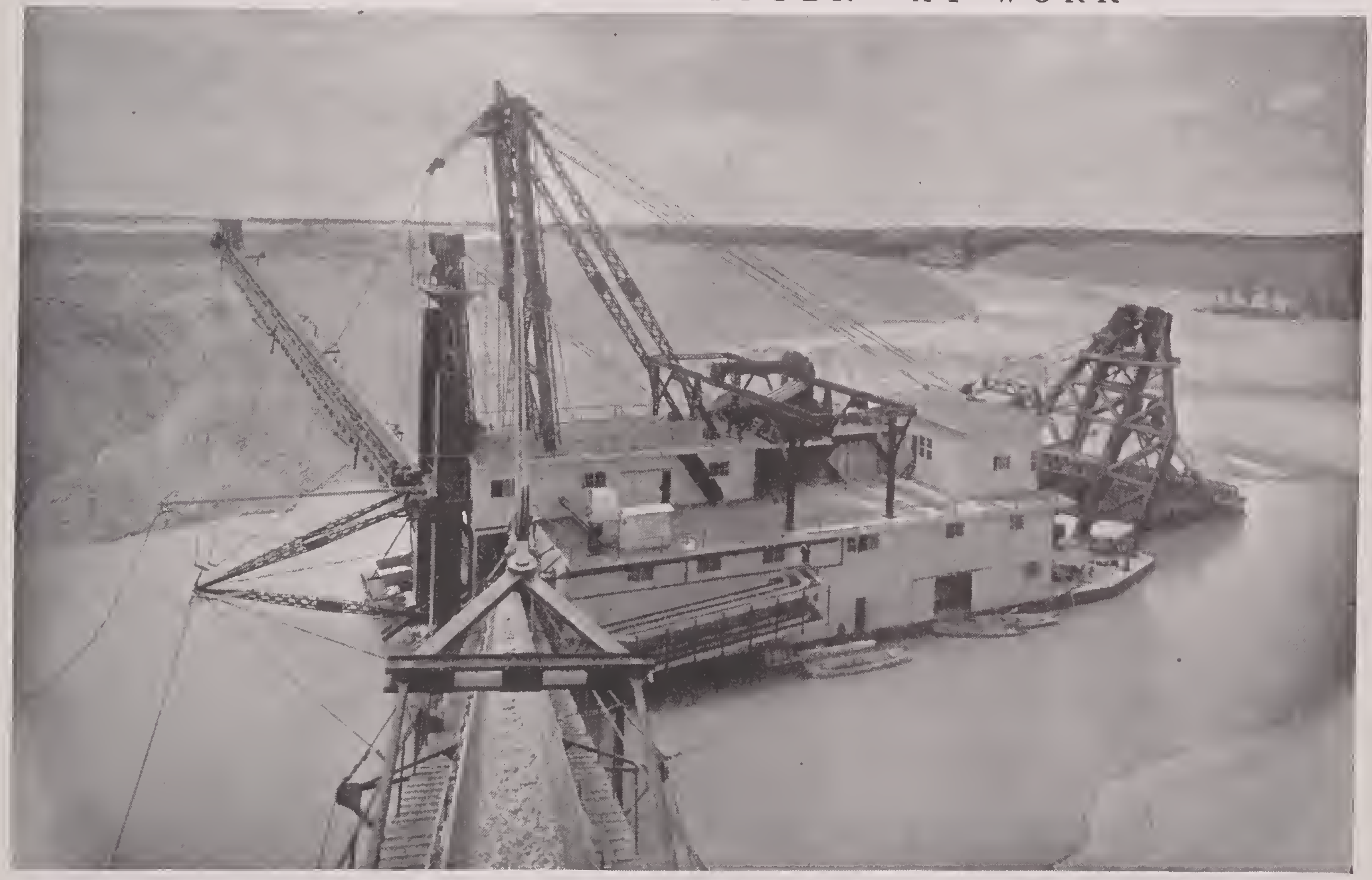
DRED SCOTT DECISION. Dred Scott was an ignorant negro slave who had belonged to an officer in the United States army. His master had been ordered from Missouri to Rock Island, Ill., and had taken Dred Scott with him into that free state. Then he had been ordered to Fort Snelling in Minnesota Territory, and again he had taken Dred Scott, although Minnesota had been declared free territory by the Missouri Compromise of 1820. At Fort Snelling Scott had married a negro woman, and when his master was ordered back to Missouri both Dred Scott and his wife accompanied him as slaves.

After a time the master died and Dred Scott decided to try to gain his freedom. He claimed that he was free because he had lived in Illinois and Minnesota, where slavery was not allowed. The case was finally carried to the Supreme Court of the United States. In 1857 a majority of the Court, through Chief-Justice Roger B. Taney, declared that Dred Scott was still a slave. What was worse, the majority of the judges went out of their way to declare further that Congress had no power to prohibit slavery in the territories, and that the Missouri Compromise was therefore unconstitutional from the beginning.

President Buchanan urged all the people to accept this decision as final, but the anti-slavery party of the North refused. They declared that the Supreme Court had in the past changed its decisions on constitutional questions, and they continued their agitation against extending slavery in the hope of a future decision as favorable to freedom as this was to slavery. (*See* Civil War and Reconstruction.)

DREDGES AND STEAM SHOVELS. Dredging means, especially, excavating soils from the bottom of lakes, rivers, and other bodies of water. It is necessary in

A GREAT "GOLD-DIGGER" AT WORK



This mighty dredge digs gold-bearing earth from the bottom of the California river on which it is floating, separates the gold from the mud and sand, and then carries the débris out over its two long conveyor arms or "stackers" to the bank. The chain of steel buckets which does the digging can be seen just dipping into the river.

DIGGERS WORTH MANY "PICK AND SHOVEL" GANGS

Above is a modern steam shovel, which can take in several cubic yards of earth at one "bite." Contrast this with what a mere human digger can do! And the steam shovel doesn't get tired, either. To the right is "the soldier's friend"—a ditch-digger that was used to make communication trenches and drainage ditches during the World War. In time of peace it digs sewers.

deepening, widening, or straightening river channels, in deepening harbors or bays, in building dikes and levees, and in preparing foundations for bridges, lighthouses, and the like. Diamonds and various metals, especially gold, platinum, and tin, are sometimes mined from river bottoms and alluvial soils by dredging. This work is done with powerful machines mounted on floats known as "dredges."

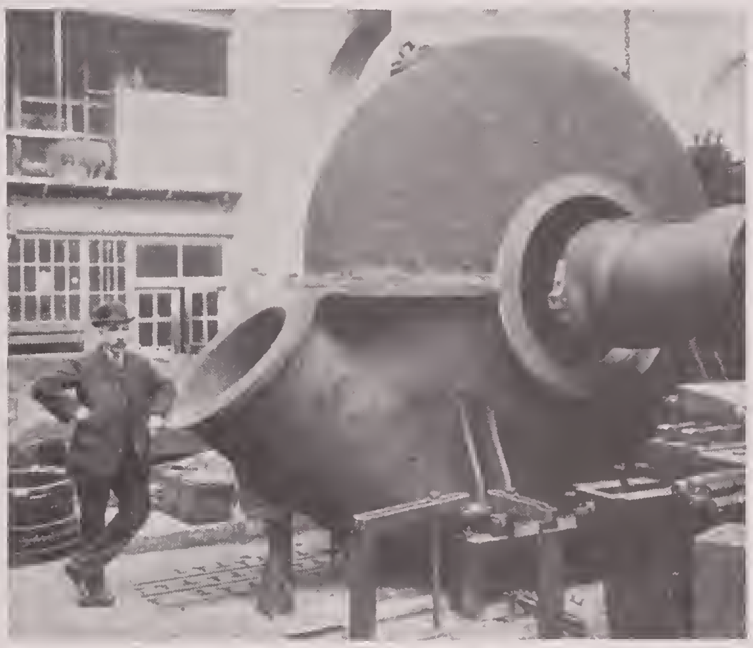
The most common form is the "dipper" dredge. This is the typical American dredge and is very largely used in river improvement work and in digging drainage canals. It consists of a hoisting engine with a swinging crane to which is attached a great thrusting shovel or dipper. The dipper is lowered to the bottom and drawn forward into the materials to be raised, by means of cables. Then it is raised clear of the water and swung around until it is in the desired position for emptying. The bottom of the dipper is hinged, and when a cord attached to the latch is pulled, the load falls out.

The dipper dredge can excavate all kinds of soil and can even rip through soft rock without blasting. The usual capacity of the buckets is from one-half a cubic yard to six cubic yards, although in the construction of the Panama Canal two mighty machines were used with a capacity of 15 cubic yards to each bucketful.

In the "clamshell" grapple dredge, a bucket composed of two great scoops, hinged at the top, is dropped from the end of a beam; the two halves are then closed, and the whole is raised by chains and tackle. Another grapple dredge has an "orange-peel" bucket composed of three or four triangular blades which reach down like a great hand and close over the materials to be raised. The grapple dredges are the only machines that can be operated in deep water.

Dipper and grapple dredges are known as "intermittent" dredges. The "continuous" dredges are of four types—ladder, hydraulic, stirring, and pneumatic types. The "ladder" dredge excavates by means of a series of heavy steel buckets fitted with a cutting edge, running at great speed along an endless chain or wheel. This type is used on big construction works, such as the Suez Canal, the Panama Canal, and the New York Barge Canal.

THE HEART OF THE SUCTION DREDGE



Here is the mighty centrifugal pump that does the work in "sand suckers" and other hydraulic dredges. Such dredges pump or "suck" up the earth mixed with water.

The "hydraulic" dredge removes soil by drawing it into a suction pipe and forcing it through pipelines by a large centrifugal pump. A revolving cutter loosens the soil and mixes it with water so that it will be readily sucked up. This type is especially adapted to filling in waste lands along waterways, and in the maintenance of a navigable channel in large inland waters. When operating in a river or along a shore, the water containing the dredged soil is pumped out through long pipelines and discharged over the area to be filled. The water evaporates or drains away, and the soil is left. Occasionally such dredges put out to sea and discharge the soil and water into barges from which it is pumped upon the land to be filled. This procedure was followed largely at Galveston, when the city was raised after the flood in 1900.

The "stirring" type of dredges stir up the fine mud and sand so that they will be carried away by the current of the water. Since the middle of the 14th century the Venetians have employed the stirring process for the removal of sand-bars. Stirring dredges have also been used in keeping a navigable channel open at the mouth of the Mississippi River. In "pneumatic" dredges compressed air is used to force soil mixed with water through a discharge pipe. This form of dredging has a special advantage when it is desired to force materials to a great distance or to elevate them upon the banks.

The "steam shovel" is the dry-land excavator. It is like a dipper dredge, except that it is mounted on heavy trucks instead of a float. Steam shovels are used for all kinds of work—in making railroad cuts, in digging gravel beds and clay beds, in excavating streets, trenches, ditches, and cellars. They are used in excavating the soft-ore iron of the Lake Superior region, and in the copper mines of Montana. Hand shoveling has been almost entirely superseded by this power-machine shoveling, where the amount of the work justifies the cost of installation.

DRES'DEN, GERMANY. To a traveler on the Elbe coming from Hamburg for example, the first glimpse of Dresden, capital of the former kingdom of Saxony, is pleasing. Above the soft curves of the broad and pleasant valley in which it lies, on both sides of the river, an irregular skyline of cupolas, towers, countless church spires, and the copper-green roofs of its royal palaces mark this city of unusual beauty.

Although primarily a commercial and industrial town—because of its position at the center of a network of railways giving access to Austria, Bohemia, and all parts of Germany, and because of its river trade—yet Dresden is perhaps best known for its magnificent art treasures, libraries, and scientific collections, and for the manufacture of "Dresden china," at Meissen, a suburb. Its art gallery (the "Zwinger") is one of the finest of its size in the world, and Raphael's 'Sistine Madonna' or Correggio's 'Holy Night' repays a trip to Dresden. For those who would see nature, Dresden is the starting point for trips into the mountains of what is called "the Saxon Switzerland."

With a history going back to the beginning of the 13th century, Dresden has been astonishingly free from war and devastation save for a bombardment during the Seven Years' War and some damage done during the period in which it was Napoleon's center of operations in 1813.

With two royal theaters, many minor theaters and music-halls, and an orchestra famous throughout the world, the Brühl Terrace on the bank of the Elbe, the great Grosser Garten which is a spacious pleasure garden at the edge of the city, Dresden has not lagged behind the rest of Germany in providing music and recreation for her citizens. Before 1914 tourists and a large English and American colony made Dresden a place where one heard English spoken with great frequency. Population, about 548,000.

DRUGS. Your corner drug-store is a museum of strange and wonderful things. The drugs assembled there, marshaled in orderly rows of shining glass bottles, have been brought from every corner of the world to help nature restore you to health when you fall sick. A single prescription may contain substances brought from five continents.

Side-wheeled steamers have chugged far into the upper reaches of the Amazon for cinchona bark, from which quinine is made, and coca leaves from which cocaine is extracted. Camel caravans have wound along snaky paths down through the hills of Persia and Arabia to the Aleppo market with their loads of gum tragacanth, which gives consistency to pills, reeking asafetida, used to stop hysteria, and colocynth, a powerful cathartic. Dog sledges have crossed the frozen plains of Siberia, swift dahabiyehs have taken advantage of the Nile flood, bullock carts have crawled creaking over the long roads of India, and down myriad Chinese riverways unwieldy junks have sailed, to bring to market such important drugs as opium, nux vomica, ajowan oil, and other healing substances on the way to the corner drug-store. The animal, vegetable, and mineral kingdoms alike have contributed to this purpose.

Today the discovery of valuable remedies is not left to chance. Great drug manufacturing establishments employ experts who are constantly seeking new drugs and experimenting with their effects. How modest seem the simple mortars, retorts, and filters of the old apothecaries compared with the equipment of a modern drug factory, with its gigantic vats, with the enormous distilling apparatus, and with its power-driven pestles crushing the raw materials in huge mortars all day long!

The 10,000 or more drugs that are used by modern physicians are generally divided into groups named according to the effect produced upon the human body. Thus we have anodynes or "pain soothers," which may be hypnotics such as chloral, anesthetics like chloroform, or narcotics like cocaine; and we have stimulants like strychnine, mustard, alcohol, spirits of ammonia, etc. Drugs which prevent or allay fever, such as salicylic acid, are called antipyretics; those which prevent infection are antiseptics; those which draw together the tissues, checking, for instance, the flow of blood from a wound—the powerful adrenalin, for example—are called astringents. This adrenalin is an example of the type of drugs drawn from animals. It is manufactured from a tiny gland of cattle—found near the kidneys—and is so strong that one two-millionth of a gram will have a noticeable effect if injected into the blood of a grown man.

Modern science has found in coal-tar a rich drug mine. The disinfectant carbolic acid, and such drugs as acetanilid, phenacetin, phenolphthalein, and a host of others are derived from this source.

The drugs of recognized value and known composition in America are listed in an official publication called the 'United States Pharmacopeia', which was designated as the legal standard for drugs by the Pure Foods and Drugs Act of 1906. All drugs which are prepared according to the formulas of the Pharmacopeia bear the stamp "U.S.P." upon box or label.

Valuable as all these and other medicinal agents may be, however, few of them should be employed except on a physician's advice. Only a very small proportion are specifics—that is, adapted to cure or prevent some special disease, as quinine cures malaria—and most of them are deadly poisons if taken in large quantities or for a long period. Untold harm has been done by promiscuous drugging, and the only safe rule is to take no drugs except those a physician prescribes. (*See* Medicine and Surgery.)

DRUM. Some historians tell us that the drum was the first musical instrument made by primitive man, though others claim this place for the flute. Among savage tribes drums were used on every occasion. They called the tribe together for battle, they beat the time for the dancers and the singers, and they played an important part in religious ceremonies. Among the ancient civilized nations we find several kinds of drums. The Egyptians used a small hand drum; the Chinese used a large drum made like our bass drum; and the Hebrews' favorite drum seems to have been a sort of tambourine.

The many shapes and sizes of drums, no matter where found, all fall into three classes: first, those made of a single skin stretched over a frame which is open at the bottom, like the tambourine; second, a single skin on a closed vessel, like the kettledrum; third, two skins, one at each end of a cylinder, like the bass drum.

The kettledrums are the most important in the orchestra today. Vellum, or calf skin, is stretched over a hollow hemisphere of metal, quite the shape of the iron pot of our great-grandmothers. This skin is held in place by a ring which can be tightened or loosened by means of screws, thus making the pitch higher or lower. Kettledrums are usually played in pairs; one tuned to sound the "do" of the scale, and one to sound the "sol." Three kinds of drumsticks are used; one with sponge tips for soft strokes, one with leather tips for medium, one with wooden tips for loud sudden tones.

The bass drum and the snare drum do not produce sounds of any definite pitch. The booming thud of the big drum is chiefly employed to mark rhythm or emphasize climaxes. The snare drum, so called because catgut strings or snares are stretched across the head to make the sound more brilliant, finds its chief use in military bands. In the orchestra it serves to add brilliancy to crescendo passages.

DRUMMOND, WILLIAM HENRY (1854–1907). The wild rugged beauty of Canada, and the spirit of romance and adventure, now fast disappearing, will always remain fresh and living in the verses of the Canadian poet-doctor, William Henry Drummond. Above all he has caught the spirit of the *habitant*, as the French-Canadians of the farms, woods, and lumber camps are called. He has made these simple hardy people speak in their own French-English dialect, making them all the more real and lovable through their broken speech and revealing the true heart beneath the rough exterior.

Born in County Leitrim, Ireland, Drummond was taken to Canada by his parents when a boy. He worked for a time in the telegraph service at Bord-à-Plouffe (Quebec province) in the center of the lumber trade, and there for the first time came in contact with the *voyageur* and the *habitant*. When, after his graduation from McGill University and Bishop's Medical College, he entered upon the practice of medicine, he chose a little community in which there were many of the French-Canadians, together with Indians and half-breeds. Robust and athletic, fond of sport and of outdoor life, he delighted in the companionship of the people who lived close to nature. He won their friendship by his sympathy and understanding, as well as by the multitude of good deeds for which he, as a country doctor, found opportunity. Afterwards Dr. Drummond became Professor of Medical Jurisprudence at Bishop's College in the same province, and won many honors; but his proudest title remained simply "*Habitant* Drummond."

Drummond's poetical works appeared in the following volumes: 'The Habitant and the French-Canadian Poems' (1897); 'Phil-o-rum's Canoe and Madeleine Vercheres' (1898); 'Johnnie Courteau and Other Poems' (1901); 'The Voyageur and Other Poems' (1905); 'The Great Fight' (1908).

DRYDEN, JOHN (1631–1700). One day near the close of the 17th century a little lad was brought to Will's Coffee House in London, the great gathering place for literary men, to gaze upon the greatest writer of the time. That little lad was Alexander Pope, and that great man, whose ideas of poetic composition he was to follow and carry still further, was John Dryden,—poet, critic, and essayist.

Dryden taught that correctness, polish, and elegance, rather than originality, imagination, and feeling, were the essentials of good poetry. He chose the regular heroic couplet (two lines of iambic pentameter rhyming together) as "fittest for discourse, and nearest prose." His age was indeed an age of prose, and although he exerted a great influence on the poetry of his own period and the one which followed, his most permanent influence in English literature has been not in poetry, but in prose. Indeed modern English prose style may be said to begin with Dryden, and although we no longer place him with the first of the poets, he is still regarded as a great critic.

Many of his lines have passed into the currency of everyday speech, as for example:

> None but the brave deserves the fair.
> Men are but children of a larger growth.
> Few know the use of life before 'tis past.
> Great wits are sure to madness near allied.

Born in the little village of Aldwinkle in Northamptonshire, he came of Puritan stock, and his first important poem was an elegy on the death of the Puritan leader Cromwell, but he turned Royalist and welcomed King Charles II with another poem, 'Astraea Redux'. Later he also changed to the Roman Catholic faith, which he defended in an allegorical poem, 'The Hind and the Panther'.

For a long time Dryden wrote only plays—bombastic heroic tragedies, and comedies which reflected the low moral tone of the day. He also wrote several personal and political satires, of which 'Absalom and Achitophel' is the most powerful in English literature. He made translations from the Greek and Latin classics, and wrote a number of critical essays in the form of prefaces to other works. But of all his works, his beautiful odes, 'Alexander's Feast' and 'Ode on St. Cecelia's Day', are the favorites today.

DUBLIN, IRELAND. Picture a city with a magnificent bay, splendid parks, massive public buildings, wide streets, spacious and well-kept squares, clean and elegant quays. Such is Dublin, the capital and largest city of Ireland, which reposes at the foot of the high rugged promontory of Howth on the central part of Ireland's east coast.

In the heart of the city is the 20-acre park called St. Stephen's Green. A short trip thence brings you to O'Connell Bridge, one of a dozen bridges over the Liffey River, which bisects Dublin from west to east. Facing the river on the north bank is the law-court building called the Four Courts. The quays are covered with cargoes discharged from ships and the scene is an animated one, amid the numerous liquor shops, eating houses, and stores.

O'Connell Bridge links the famous 120-foot wide Sackville Street on the north side of the Liffey with the district to the south, where lie many of the shops and public buildings. Here are the huge colonnaded semi-circular Bank of Ireland, formerly the Irish Parliament House, and the large group of buildings comprising the University of Dublin. The aristocratic section comprises much of the eastern half of the city, toward the bay. In dismal contrast to its mansions and splendid squares and terraces is the squalid slum district, with its crooked streets and wretched hovels, in the southwestern part of Dublin.

Among the historic buildings the chief is the Castle, originally built in the 13th century and now the seat of the Irish government. Notable also are the Protestant churches, St. Patrick's Cathedral and Christ Church. St. Patrick's, though in a poor section of the city, is a magnificent Gothic structure commenced between 1220 and 1260. Its most famous dean was Jonathan Swift. Christ Church, of early English Gothic style, was founded in 1038 by a Danish king of Dublin. There are many beautiful Catholic churches and numerous monuments and statues (Lord Nelson, O'Connell, Grattan, Burke, Goldsmith, Smith O'Brien, Barry Sullivan, etc.).

Dublin is not a city of great manufacturing activity, brewing and distilling being the chief industries. There is a large export trade in provisions and live stock. Much of the inland traffic, consisting principally of farm and dairy produce, is brought by canals and by rail lines extending to all parts of Ireland.

Phoenix Park, with 2,000 acres of land and great herds of deer, lies just outside the city limits. It was the scene, in 1882, of the political murder of the chief secretary for Ireland and his undersecretary.

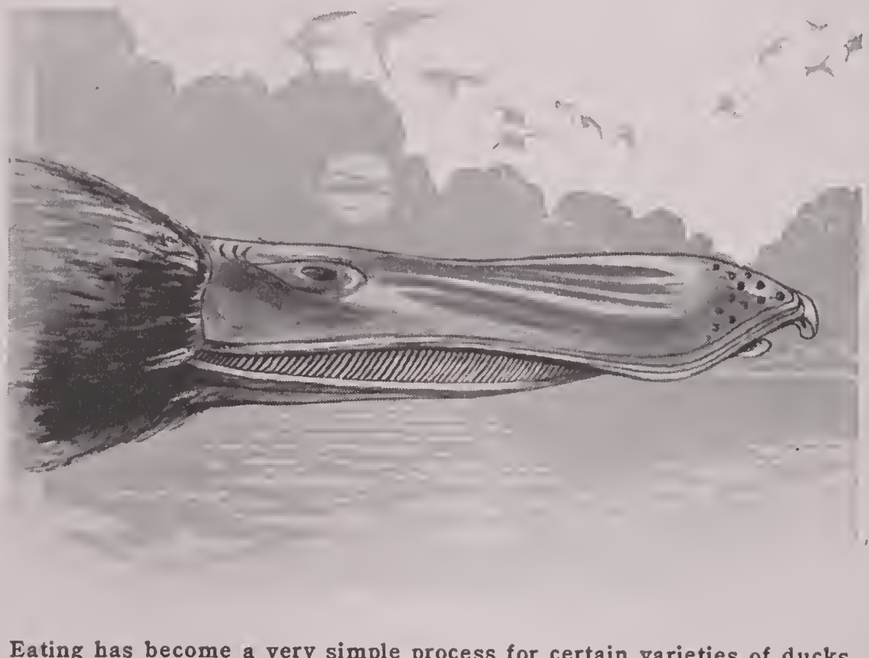
Dublin itself was the scene of the short-lived "Easter Revolt" in 1916, when an Irish republic was proclaimed and a provisional government appointed in the expectation of German aid to be brought by Sir Roger Casement. The execution of the leaders, following the suppression of the revolt, still further widened the breach between England and Ireland. Population, about 400,000.

That Great Traveler
THE DUCK

Expert Flyers, Swimmers, and Divers, Whose "Quack" Language is Known the World Over—How Nature has Made Them Waterproof—The Many Varieties and How They are Hunted for Flesh and Feathers

DUCK. Over a mile a minute is the wild duck's speed record for short flights, and he is also an expert swimmer and diver. Nature has been very good in clothing these birds, for in addition to a coat of closely packed feathers, she has provided them with an inner dress of thick down that protects them from both wet and cold. The molting, too, she has arranged so that at no time is the power of flight lost, for the quills of their tail and strong wings are molted in pairs, leaving always a perfect balance. A special spring shedding of the feathers provides a soft lining for the nest-home. The web feet are set in the best position for swimming; this, however, has the disadvantage of bringing the legs so far back on the long body that the bird walks with an awkward waddle. The male bird, called the "drake," has showy plumage, but the female generally wears feathers of dull brown and buff. Wild ducks feed on insects, small water-creatures, grass, roots, and seeds. They nest in trees or in marshy ground.

A DUCK'S DISH AND SPOON



Eating has become a very simple process for certain varieties of ducks. They simply open their bills and take in a mouthful of water or soft mud. When they close their bills, the sieve-like fringes you see here let out the liquid and hold the solid particles of food.

The 125 wild species are found in all parts of the world, except the Antarctic continent. They are of two classes—the sea-ducks and the pond ducks. The distinction is mainly one of habit and food, though there is also this difference in structure—in the pond and river species no webbing connects the hind toe with the foot, while in sea-ducks the hind toe also has a lobe or web.

Of the river ducks, the mallard is the most important. This species is abundant over most of the Northern Hemisphere, and from time immemorial has furnished mankind with appetizing food. It is the chief water-fowl of most game preserves, in some of which 10,000 birds are reared annually. During the winter and spring the drake wears a head-dress of glossy green with purple lights; his back is grayish-brown, while his wings, of the same color, are banded with greenish-purple and white. The under-feathers are a lighter brown-gray. During the summer his dress is dusky-brown, much the same as that of his mate (for illustration in colors *see* Birds).

The teal is the bantam of the family, but it holds the flying record. Shoveler or spoonbill is the name given to a species whose great clumsy bill gives the bird a topheavy appearance. Around the edge the bill is furnished with a set of fringed bristles, which act as a sieve through which mud and water run out, leaving the food within.

The wood-duck is one of the most richly dressed birds of the United States. The drakes are green, blue, and purple, with white streaks above and red, yellow, and white below. The females are brown above and yellowish brown beneath. Both duck and drake have long full crests, narrow bills, and long soft broad tail feathers. These birds build in hollow trees, sometimes 40 feet from the ground and a mile

SOME PROMINENT FAMILIES OF ''QUACK LAND''

On the left are three kinds of Ducks, just taking flight from a marshy spot. The upper one is a Pin-Tail, the two below are Black Ducks, and the rest are Baldpates. On the right Mr. and Mrs. Mallard are just starting out from home.

from the water. When ready to leave the nest, the babies are encouraged to parachute to the ground and then in a family party are led to the water.

Of the sea-ducks the most important is the canvasback, the bird that made Chesapeake Bay famous. It is considered a greater luxury than "quail on toast," but its flesh is at its best only when it has been feeding on wild celery or upon the *wappato*, a bulblike root which it finds in the Far West. The name canvasback was given because the grayish feathers of its back and sides are so compact as to resemble coarse canvas. It is a hardy bird and on its autumn migration reaches the United States late in October. It may remain in the Great Lakes region until driven out by ice. A few are found on or near the New England coast, but the great majority move to the south. Chesapeake Bay was formerly the great feeding ground of the canvasback, but now they are found in greater numbers about Pamlico and Albemarle Sounds. They dive in reedy waters for the roots on which they feed.

In the left-hand picture we see two Green-winged Teal on the wing. Below them, a pair of Wood-Ducks are sitting on a log. Two Blue-winged Teal stand in the lower corner. In the right-hand picture are two Gray Ducks, with a pair of Shovelers further to the right.

Very closely related and equally good as food, when equally fed, is the redhead. It is smaller than the canvasback and has more black in its plumage. The redhead is found on the Atlantic and Pacific coasts.

BILL OF FARE RIVALS

The Canvasback Ducks at the top and the Redhead Ducks below look very much alike, except that the Redheads are somewhat smaller and darker. Both kinds are highly prized as food.

The mergansers (sometimes called sheldrakes) are a small group of fish-eating ducks. They have striking and beautiful plumage—both sexes being usually crested. The flesh is of a strong fishy flavor.

The Duck that Gives the Eiderdown

The eider ducks are native to both northern Europe and America. Their value lies entirely in the down and the eggs they furnish. The duck pulls down from her breast and makes a padded blanket that completely covers the nest. Upon the removal of the down and eggs she repeats the process, including the laying of more eggs. If the down-gatherers again empty the nest, it is said that the drake denudes his breast so that the nest refilled by the duck may still be properly fitted out with its blanket. The down has such commercial value that in some parts of Europe the birds are conserved and protected.

The domestic ducks of North America and Europe are from the mallard stock, but in the East and Africa other species have contributed. The White Aylesbury and White Pekin are a Chinese duck and were first introduced into the United States in 1870.

Ducks are of the order *Anseres*, which also includes the geese and swans. Scientific name of mallard duck, *Anas platyrhynchos;* of green-winged teal, *Nettion carolinense;* of shoveler, *Spatula clypeata;* of wood-duck, *Aix sponsa;* of canvasback, *Marila valisineria;* of redhead, *Marila americana;* merganser, *Mergus americanus;* of northern eider, *Somateria mollissima borealis.*

DUCKBILL. Here is a riddle of the old-fashioned kind that might have puzzled even Oedipus, the old Greek who made such short work of the Sphinx. See if you can guess it:

"It has a beak like a duck, hair like a cat, and a tail like a beaver. It has four legs and web-feet. It lives both on land and in the water, lays eggs and hatches them like a bird, but feeds its young with milk from the breast. What is it?"

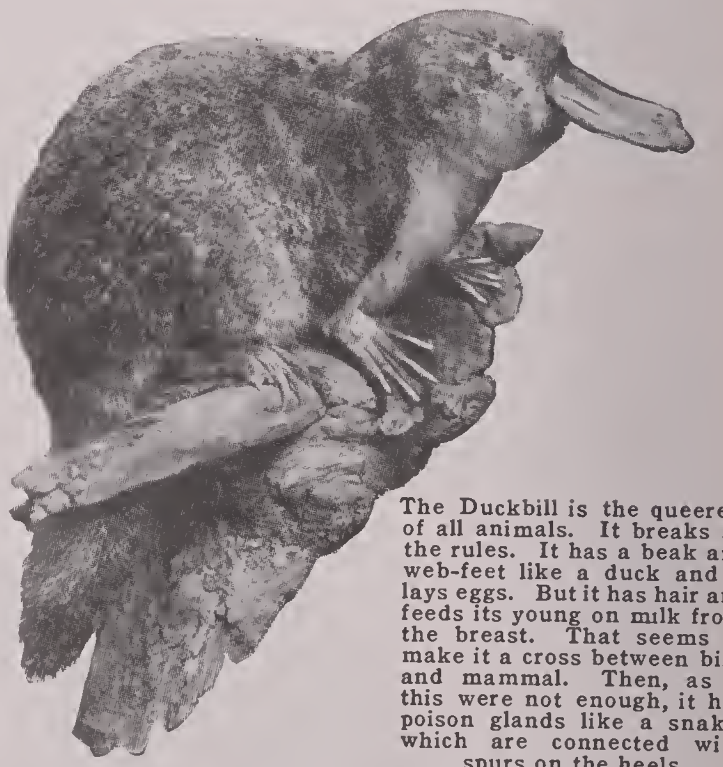
Perhaps you give up at once; or perhaps you will exclaim: "There is no such animal!" This was the attitude of the British scientists who saw a stuffed specimen for the first time, and declared it was a "clever fabrication."

But it was not long before a living example of this freak of nature was brought from Australia, and the scientists promptly called it *Ornithorhyncus paradoxus*, which in Greek means "bird-billed contradiction." It was a good name, for this creature not only contradicted the doubters, but contradicted also the former laws governing the shapes and habits of animals. For ordinary purposes, however, it is known as the "duckbill platypus" (*platypus* meaning "flat-footed").

This creature, perhaps the strangest of all living things, is only found along the streams of southeastern Australia and of the island of Tasmania. It is a good swimmer, diving to the muddy bottoms in search of water insects and worms which it roots out with its broad flat beak.

Its den, built far back in the bank of the stream, usually has two openings, one under water, the other concealed by weeds above the surface. There the female builds her nest and hatches her eggs, usually two in number, and there she suckles her young. The young first develop teeth, but these soon fall out to make way for the tough horny plates with which the adult chews its food.

AN "IMPOSSIBLE" CREATURE



The Duckbill is the queerest of all animals. It breaks all the rules. It has a beak and web-feet like a duck and it lays eggs. But it has hair and feeds its young on milk from the breast. That seems to make it a cross between bird and mammal. Then, as if this were not enough, it has poison glands like a snake, which are connected with spurs on the heels.

The male duckbill is the only poisonous mammal in the world. It has on its hind legs grooved spurs connected by long tubes with poison glands situated near the thighs. The poison closely resembles snake venom, but appears to be seldom used.

The voice of these curious animals is like the growl of an angry puppy, but they are exceptionally timid, rarely showing more than their nostrils above the water. Once captured, however, they are gentle and easily tamed, recognizing their friends, answering to their names, and eating from their keeper's hand.

A land-dwelling relative of the duckbill is the Echidna or "spiny ant-eater," also a native of Australia. It has quills like a porcupine and a long slim beak. It also lays eggs and suckles its young, but the eggs are hatched in a pouch on the mother's stomach, like the pouch of a kangaroo.

The duckbill and the spiny ant-eater are looked upon by scientists as modern illustrations of those ancient "transitional" forms of life, produced while nature was evolving the mammals, the birds, and the reptiles of today from the simple primitive animal types which alone existed millions of years ago (*see* Evolution). The structure of the duckbill, particularly, shows close resemblances to certain ancient fossils, and the arrangement and shape of its bones is part bird, part reptile, and part mammal in character.

That these creatures should be found only in the Australian district is explained by the theory that these lands became separated from their neighbors early in the history of evolution.

DULUTH', MINN. Snorting tugs and giant freighters, belching forth clouds of black smoke, plow their way to and fro in that natural harbor—one of the finest in the world—where Duluth, at the head of Lake Superior, proves itself truly the "metropolis of the unsalted seas" and gateway to the great Northwest. Some of these long low freighters are taking on cargoes of red hematite iron ores from the rich Vermilion and Mesabi ranges for the iron and steel plants of Pittsburgh and Chicago. Others are loading with magic speed millions of bushels of wheat from Manitoba, the Dakotas, and the Red River valley for the mills of Buffalo and other lake ports. Still others are taking on huge cargoes of lumber and flour; while at some of the world's largest coal docks, vessels now on their return trips are discharging millions of tons of coal to be sent by rail far and wide through the Northwest.

Because Duluth is the nearest shipping point on the lakes for this region of vast agricultural and mineral wealth, it is one of the world's greatest ports, with annual shipments (combined with those of Superior, her neighbor across the St. Louis River) of more than 50,000,000 tons. With the falls of the St. Louis River turning the wheels of its industry, Duluth also possesses a large steel plant, blast furnace, iron works, cement and match factories, machine shops, shipyards, and extensive wholesaling businesses.

But Duluth is not merely a city of humming factories, railroad yards, grain elevators, ore docks, and wholesale houses. Located on a terraced bluff over 600 feet high, it is an attractive residential city, healthy and progressive. One of its interesting sights is an aerial bridge 400 feet long and 186 feet high which carries passengers and vehicles across a ship canal on a 20-foot platform suspended from the steel structure high above. And close by, accessible by good roads, extends a sportsman's paradise—lakes and streams that teem with fish, surrounded by an empire which Nature still claims as her own.

The city was named for Sieur du Lhut, a French trader and explorer who skirted Lake Superior in 1678, and was Duluth's first known white visitor. In 1853 the first permanent settlement was made there. The city grew very rapidly after 1880, when the Vermilion and Mesabi iron ranges developed and when the railways were extended into the wheat regions of the Northwest. In 1912 it adopted the commission form of government. Population, about 100,000.

DUMAS (*dü-mä'*), ALEXANDRE (1803–1870). Nearly every critic who has written of this clever French novelist has qualified his praise. One says that Dumas' novels are "outside literature"; another that his writings are careless; and yet they all agree that for charm, movement, clever talk, and brilliance he is unsurpassed. Robert Louis Stevenson tells of sitting down with one of Dumas' novels, 'The Vicomte de Bragelonne', "for a long, silent, solitary lamplight evening by the fire." And still he does not know why he should call it silent "when it was enlivened with such a clatter of horse-shoes, and such a rattle of musketry and such a stir of talk," or why he should call those evenings solitary in which he "gained so many friends."

Alexandre Dumas was born in 1803 in Villers-Caterets, a little town near Paris. His pictures show a smiling face surrounded by a mop of black hair. His lips are thick, showing plainly his likeness to his grandmother, who was a negress. His schooling was not of much consequence, and after his family had procured for him a humble government position in Paris, he overcame his lack of knowledge by wide reading. His first great success was a play called 'Henry III', but it was the novel 'Monte Cristo' which gave him fame. 'The Three Musketeers', which followed, set the pace for his other novels.

The astonishing thing about Dumas' work is its volume. He published 60 plays and 200 novels and books of travel. Of course no single writer could produce that amount of manuscript. Dumas hired various young apprentices at fiction to look up the historical material, to write the skeletons of his stories, when he then proceeded to fill in with incident and dialogue. Nor was Dumas satisfied to hunt fresh material; he often borrowed from Shakespeare or anyone else he fancied. He defended his method by saying that "the man of genius takes his material where he finds it, and he doesn't steal but conquers."

Naturally, the mass of fiction which he put out was uneven. The best is thought by many to be 'The Three Musketeers', and the two sequels, 'Twenty Years After' and 'The Vicomte de Bragelonne'. In this series he follows the fortunes of D'Artagnan, a Gascon soldier, and those of Aramis, Porthos, and Athos, his three faithful friends. The narrative clings closely to French history between the years 1626 and 1671. Louis XIII, Louis XIV, Richelieu, Anne of Austria, Buckingham, Mazarin are made alive and vigorous. When Dumas doesn't find enough intrigue, mystery, love affairs, and duels to satisfy him, he adds as his imagination prompts him. He expands unimportant characters until they fill the canvas of his scenes.

But more interesting even than the merely historical background is the spirit of rollicking good-humor, self-sacrificing friendship, and daredevil adventure that animates the books. Dumas' heroes come out of their worst scrapes with wounds that heal quickly, with spirits that are undaunted. For pure romance their equals are hard to find.

Dumas' personal history was a stormy one. Feminine intrigues, politics, debts, great wealth, exile, and honors followed in rapid succession. He acknowledged as his son and gave his name to Alexandre Dumas, the Younger (1824–95). The son achieved a place in literature chiefly as a dramatist. 'Camille', his best known play, was long the favorite rôle of the great French actress Sarah Bernhardt.

Dumas' chief works are: 'Les Trois mousquetaires' (The Three Musketeers), 1844; 'Vingt ans apres' (Twenty Years After), 1845; 'Monte Cristo' (1848); 'Le Vicomte de Bragelonne' (1848).

DUN'KIRK, FRANCE. When the German army drove across Belgium late in 1914, aiming for the seaports of Calais and Dunkirk, it found itself stopped not far from the French border by an unexpected barrier. For the Belgians had broken down their dikes and flooded the countryside, and the German soldiers were stopped by the lakes that suddenly appeared or stuck in the mud that they formed. And while they were trying to get around this obstacle the Allies had time to fortify a line of defense which the Germans, though they tried several times, were not able to break down. So they never did get to Dunkirk, still less to Calais, and were never able to launch from there the great attack they hoped to make on England.

But though they never took Dunkirk, they got near enough to bombard it with long range guns, and they kept up this bombardment for nearly four years. The city suffered a great deal during this time, but it never lost its courage, nor stopped its work of shipbuilding and trading. Indeed it was so courageous that the French government cited it in its bulletins, just as they gave medals to individual soldiers who had shown rare courage, as a "heroic city, worthy example to the entire nation."

The city got its name of Dunkirk (French, *Dunkerque*) because when it was founded in the 7th century it was only a tiny church, or "kirk," on the sand dunes, the name meaning "Dune-church." Dunkirk has been ruled successively by Spain, Burgundy, and England, who held it for a few years following 1658. England sold it to Louis XIV and it has since been a part of France.

The chief industries are shipbuilding and trading by sea, and the manufacture of linen, leather, cotton, soap, etc. Every year Dunkirk sends a fleet to the cod fisheries of far-off Iceland. Population, about 40,000.

DÜRER (*dü'rĕr*), ALBRECHT (1471–1528). The story of Albrecht Dürer, "prince of German artists," is the story of a poor boy whose genius and industry made him one of the greatest figures in the stirring times of Luther and Charles V. At the height of his fame, emperors, kings, statesmen, and the master artists of the day were proud to call him their friend. And when he traveled, he naively tells us, "the people did obeisance unto me as if they were leading some great lord."

Dürer was one of 18 children of a humble goldsmith in Nuremberg, Germany. Think how hard the father must have worked to fill so many hungry mouths! "My father," writes his son Albrecht, "took special delight in me. Seeing that I was industrious in working and learning, he put me to school; and when I had learned to read and write, he took me home from school and taught me the goldsmith's trade."

But Albrecht was more interested in drawing and painting than in the practical side of this art. Even as a child he had astonished everyone with his lifelike sketches and his skill in drawing perfect lines and circles without ruler or compasses. So at 15 he entered the shop of the best painter of the town, where his rude and mischievous companions played many a trick on him. But heedless of all obstacles, the lad pursued his chosen course, became skilled in the use not only of the painter's brush, but also of the engraver's tools.

His apprentice days over, Dürer traveled in Germany and Italy, and speedily became famous for the liveliness of his portraits and other paintings and for the richness of their coloring. What is even more important, he was turning out an enormous number of examples of the new art of engraving on wood and copper.

This art was still in its infancy. Men had only just begun to realize its infinite possibilities. Paintings were expensive and only the wealthy could possess them. But here was an art which made it easy to multiply and spread among the people pictures telling the stories of sacred and classical history, and to drive home for the multitudes who could not read the points in religious and social controversies.

The engraver's art was especially congenial to Dürer, and he carried it to its highest point of both craftsmanship and imaginative expression. Before Dürer, engravings were crude in design and execution. He filled in the bare outlines with light and shade, and helped to set the pattern of engraving for all time.

But the man Dürer was greater than his art. His interests ranged over all of the many-sided life of that wonderful Renaissance period. He was a zealous patriot, preferring to spend his life in his home town of Nuremberg rather than to be feted in the courts of princes and emperors. His scientific, literary, and religious enthusiasms were so ardent that in the later years of his life he devoted far more time to them than to his art; and some of his closest friendships were with such men as the scholar Erasmus and the religious reformer Luther.

The character of the man is well brought out in his own words: "Attentively regard Nature and take her for your guide, and do not depart from her, imagining that you will fare better by yourself. Truly, Art is hidden in Nature. Never think to do anything better than God has done it, for your power is pure nothingness compared with the creative activity of God."

Dürer was incredibly industrious. His own list of his works enumerates 1,254 pieces. Of his paintings, 'The Adoration of the Magi' (Uffizi Gallery, Florence), and 'Christ on the Cross' (Royal Gallery, Dresden) are among the best known. 'The Life of the Virgin', a series of 21 cuts, and 'The Apocalypse', a series of 15, rank among his best woodcuts. 'The Knight and Death', 'Melancolia', and 'St. Jerome in his Study' are considered the greatest of all engravings on copper.

DYES. Early in the World War, we began to notice something happening to our clothes. New black stockings, after a few washings, turned queer slaty grays and greens. Odd colors, which often faded or changed on exposure, appeared in the shops instead of familiar standard shades, now unobtainable. Later merchants posted notices that they could not guarantee the colors of fabrics.

WHERE COLORS FOR CLOTHES ARE MADE

In these big vats heavy machinery is slowly mixing ingredients into a substance which will turn out to be a dye for coloring cloth. It is a simple process, once the exact chemical reactions are known. But the difficulty lies in finding the substances which will produce the desired color.

The reason was that Germany, which before the war had practically furnished the world's supply of dyes, was under blockade. British and American textile industries were crippled. Dyestuffs that before the war had brought 60 cents and $1 a pound now sold for $34 and $48. Great Britain's Highland regiments, it is said, could not get colors for their kilts until smuggled German dyes arrived.

Before the war the United States imported 80 per cent of the dyes it used, and the materials for most of the remaining 20 per cent. When inexperienced American manufacturers attempted to meet the emergency, they at first made many mistakes, such as the use on cotton goods of dyes suitable only for silk and wool. Taught by necessity, however, they learned rapidly, and soon made dyes equal to those of German origin. In a few years American manufacturers had produced 400 of the 900 commonly imported German dyes. All this, however, is only one recent chapter in an absorbingly interesting story which runs back to the dawn of civilization or beyond.

Just What is a "Dye"?

First, what is a dye? Not every coloring substance. A dye, unlike a paint or stain, becomes physically or chemically incorporated in the fibers of the dyed material. One theory, provisionally accepted by many for cotton dyes, at least, is that the dye on the fabric is held in "solid solution," as it were. Another theory, generally regarded as probable for silk and wool dyes, holds that there is a real chemical union between an acid dye and a basic fiber (*see* Acids and Alkalies) or between a basic dye and an acid fiber.

Dyes are applied to raw stock, to the spun yarn, or to the woven fabric. "Discharge" processes treat the fabric so that it will discharge a portion of the dye to produce a white polka dot or other figure. "Resist" processes, by which a portion of the fabric is protected from the action of the dye, are exemplified in the batiks in which artists have recently taken so much interest.

The first dyers were no doubt housewives like our own great-grand mothers, who dyed with the butternut, hickory, oak-galls, and other native vegetable substances the stuffs that they had spun and woven. Not until the hand loom and spinning wheel went to the attic and the museum did dyeing cease to be a household art.

Natural dyestuffs abound everywhere, and were used even in savage times, yet those which give vivid, beautiful, and lasting colors are not numerous, and early became prized articles of commerce. Such was the precious Tyrian purple (really a crimson), which, made from a Mediterranean shellfish a thousand years before Christ, later dyed the robes of Roman emperors and chief magistrates. Such, though less costly, were indigo (*see* Indigo), madder, turmeric, and later, cochineal (*see* Cochineal) and fustic, a yellow dye from the wood of a tree grown in South America and the West Indies.

Egypt, Persia, and India early perfected the art of dyeing. India especially was the source of many of the best dyes until modern times. Indigo was the "Indian dye" to the Greeks and Romans. The dyers' art, at least commercially, was largely lost in Europe from about the fall of the Western Empire until the Moors planted madder in Spain, and returned Crusaders revived dyeing in northern Italy, whence the art spread to France, Flanders, Germany, and England. The discovery of America gave the world many new dyes, particularly cochineal, logwood, and fustic. When the route around the Cape of Good Hope was opened up, larger quantities of dyestuff were imported into Europe from India. Desperately and vainly did the European woad-growers fight the importation of the "devilish drug" indigo; but the whirligig of time had in store its revenges on the lordly indigo planters.

Hitherto practically all dyes had been made from organic substances, which it was supposed could not be produced artificially. In the first half of the 19th century, however, the laboratory synthesis or combination of an organic compound was accomplished. If one, why not others? In 1856 an Englishman, Perkin, attempting to make artificial quinine from coal-tar, accidentally derived a mauve substance from aniline, a colorless oily coal-tar derivative. Aniline had first been isolated from indigo, and was so called from "anil," an ancient word which in many languages means "indigo." Perkin's mauve coloring was the first aniline dye.

How Germany Captured the Dye Market

The hint was lost on all save one country. Germany, just starting on the industrial race toward a military goal, was as keenly interested in industrial chemistry as the other nations were indifferent. German chemists and manufacturers, subsidized by the German government, eagerly set forth to explore and conquer the unknown realm of coal-tar and its products. One by one the natural dyes were synthetically produced from coal-tar intermediates. The last stronghold fell when in 1897 a synthetic indigo was placed on the market. Natural dyes were nearly swept from the field, and Germany supplied the world with a large part of the synthetic dyes. One German plant produced 11,000 colors and shades. In her conquest of the dye market alone, Germany had gained a province worth a king's ransom, yet its direct value was slight compared with its strategic value as a key to the entire coal-tar industry, including explosives, photochemicals and synthetic medicines. The war destroyed the German monopoly by compelling other countries to develop neglected sides of the coal-tar industry. (*See* Coal-Tar Products.)

Thus chemistry has replaced almost all the old dyes. Cochineal, catechu, and logwood are still used, especially the latter for blacks on silk and leather. Cheaper dyes are now said to be promised by recent processes which derive the intermediates from petroleum instead of coal-tar.

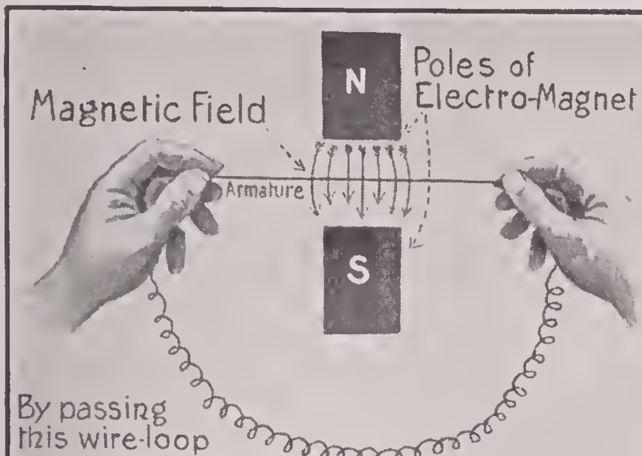
DYNAMITE AND NITROGLYCERIN. Nitroglycerin, the most powerful explosive in common use, was discovered in 1846 by the Italian scientist Ascanio Sobrero. It is made by treating glycerin with a mixture of concentrated nitric and sulphuric acids. Although used as a headache remedy, under the name "glonoin," it proved too difficult and dangerous for practical blasting purposes until Alfred Nobel of Sweden began his experiments in 1862. Nobel's brother was blown to pieces during the tests, and Nobel was forced to move his laboratory to a barge anchored out in the middle of a lake. Then a ship loaded with nitroglycerin blew up off Colon, Panama, and most of the nations of the world forbade their vessels to carry it. But the Swedish chemist refused to abandon his labors, and in 1866 he was rewarded by the invention of dynamite. This is today the commonest and safest of the high explosives, for the first time enabling man to blast away great masses of rock and other obstacles with comparative safety.

Dynamite consists of a mixture of the liquid nitroglycerin with some absorbent substance of "dope" giving it a solid form. The absorbent used by Nobel was *kieselguhr*, a kind of earth formed by countless millions of tiny fossil plants known as "diatoms." Later wood pulp, charcoal, plaster of paris, and many other substances came to be used as absorbents. Perhaps the most powerful form of dynamite is the "blasting gelatine" devised by Nobel in 1875.

Ordinary dynamite is usually made in the form of "sticks" from one to two inches in diameter and about eight inches long. These consist of brown paper wrappers coated with paraffin to keep out moisture. If a small quantity of dynamite is set on fire, free from pressure, jar, or vibration of any kind, it will burn; but if the least blow strikes it while burning, such as the fall of a tiny pebble, it will explode with great violence. Dynamite is usually set off with a detonator or blasting cap. (*See also* Explosives; Glycerin.)

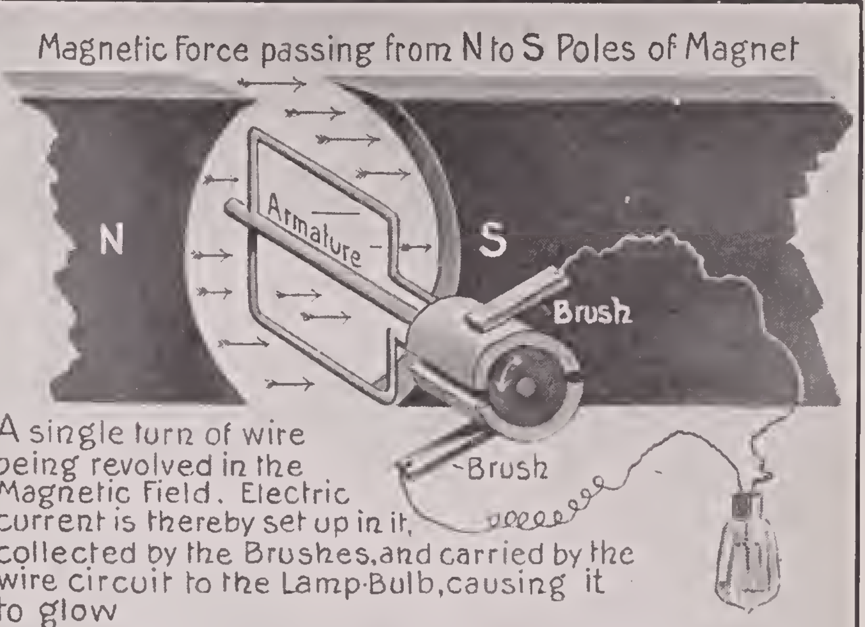
DYNAMO. All the large dynamos that furnish the power to run our street and interurban cars, light our houses and streets, and furnish electric current for a thousand other purposes, owe their existence to the epoch-making discovery of Michael Faraday in 1831. Faraday found that when a wire connected with a circuit ready to carry electricity is moved quickly across the space in front of the pole of a magnet, an electric current is set up in the wire and thus in the entire circuit. The current continues only during the motion. Faraday thus discovered how an electric current can be produced by mechanical work. The only electric currents known previous to this great discovery were the small currents from voltaic cells or the very feeble currents from thermocouples. The dymano is a machine based upon Faraday's discovery, in which electric currents are generated by moving wires continuously across the space in front of a mag-

THE MACHINE THAT PROVIDES ELECTRIC CURRENT



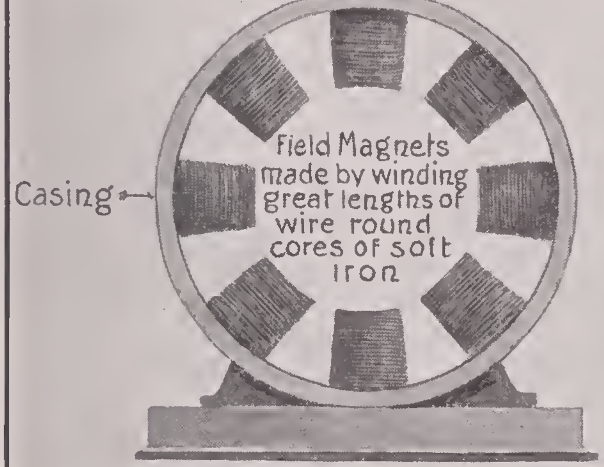
By passing this wire-loop backwards and forwards through the Magnetic Field, a current of electricity is induced in the wire

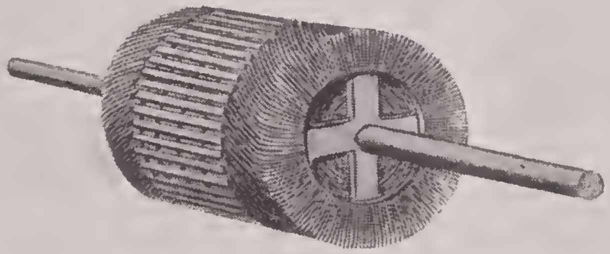
THE SIMPLEST FORM OF DYNAMO



A single turn of wire being revolved in the Magnetic Field. Electric current is thereby set up in it, collected by the Brushes, and carried by the wire circuit to the Lamp-Bulb, causing it to glow

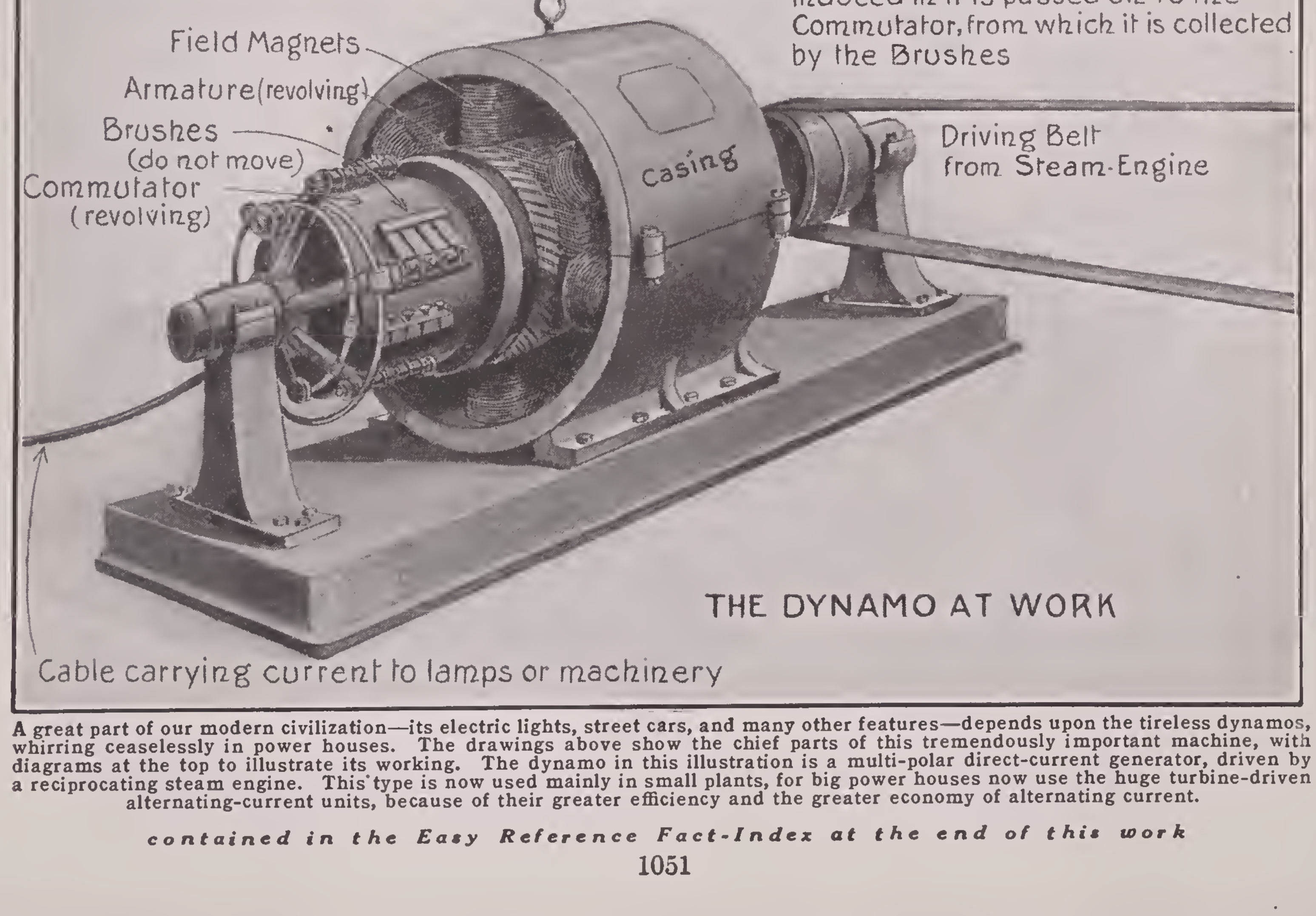
HOW THE ELECTRIC CURRENT IS COLLECTED AND CARRIED TO THE LAMP


Casing
Field Magnets made by winding great lengths of wire round cores of soft iron



THE ARMATURE, which is revolved at great speed in the Magnetic Field. The current of electricity thereby induced in it is passed on to the Commutator, from which it is collected by the Brushes

THE PRINCIPAL PARTS OF A DYNAMO



THE DYNAMO AT WORK

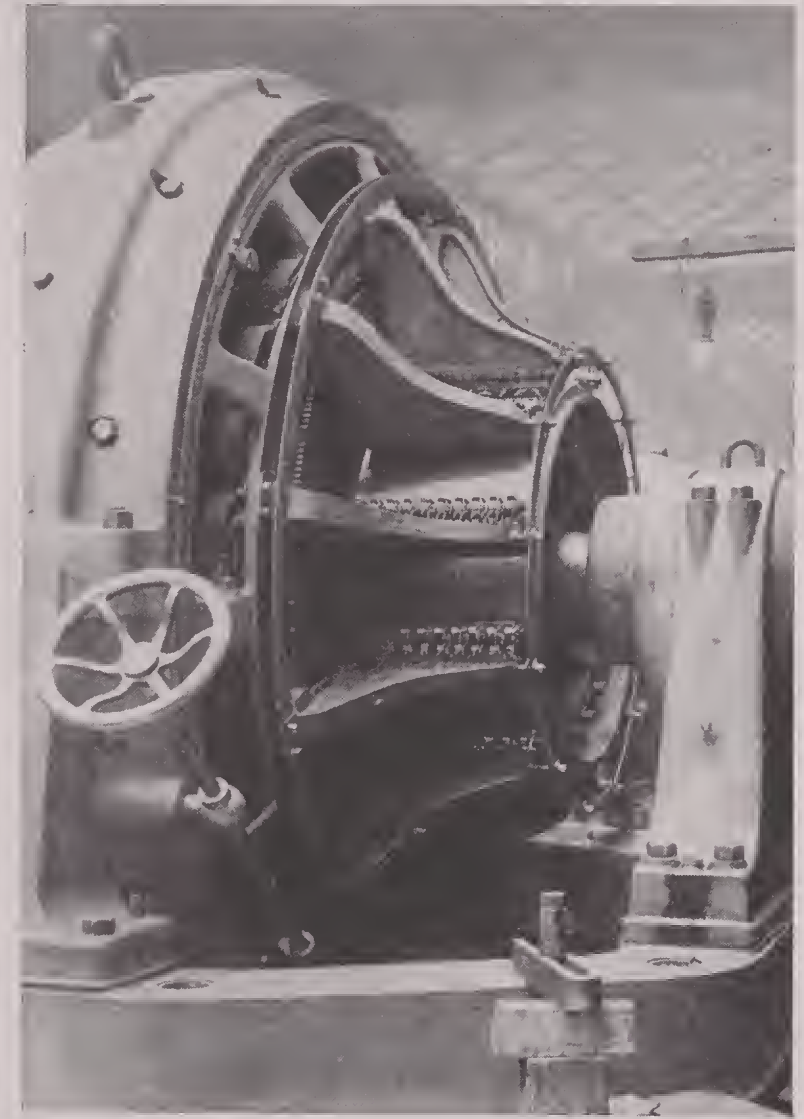
Cable carrying current to lamps or machinery

A great part of our modern civilization—its electric lights, street cars, and many other features—depends upon the tireless dynamos, whirring ceaselessly in power houses. The drawings above show the chief parts of this tremendously important machine, with diagrams at the top to illustrate its working. The dynamo in this illustration is a multi-polar direct-current generator, driven by a reciprocating steam engine. This type is now used mainly in small plants, for big power houses now use the huge turbine-driven alternating-current units, because of their greater efficiency and the greater economy of alternating current.

net. Instead of moving the wires, the magnet may be moved in reference to the wires. (*See* Magnet.)

The essential parts of a dynamo are, then, the magnet and the system of wires in which the currents are generated. This system of wires is wound on an iron core and is called the "armature." In all large dynamos the magnet, called the "field magnet," is an electro-magnet because electro-magnets can be made much more powerful than steel permanent magnets. The field-magnets of some of the earlier dynamos were permanent steel magnets, and such machines were called magneto-electric machines or "magnetos." The little dynamos used in telephone call-boxes and in some automobiles are magnetos. Either the armature or the field magnets revolve. It is more usual in large dynamos to revolve the field magnets about the fixed armature. In small dynamos the armature is usually the moving part. The power to drive the dynamo may be from a steam engine, a steam turbine, a gas engine, or from water wheels. The electrical engineer can design the dynamo for any given current and "potential" pressure, if he knows the kind of iron in the magnets, and the design will tell the speed of the machine and the size of each part. It is very common to make the parts of large dynamos such as for the Niagara Falls plant, and not put them together until in the power house hundreds of miles distant from the shop where they were made. The design will be so perfect that the dynamo will give the required power, almost without exception.

THE ELECTRIC GIANT IN HARNESS



The huge machine shown above proves how far man has progressed in his dealings with electricity from the day when he feared it as the weapon of the gods. This machine, when it is put to work, supplies 2,000 kilowatts, enough current for thousands of electric lights.

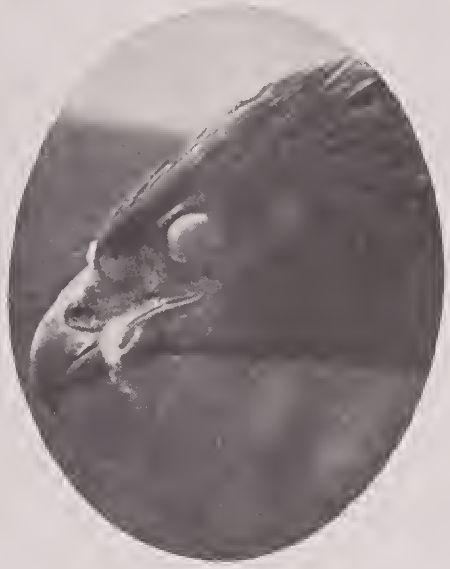
To connect the moving armature with the external wires and thus to the lamps, motors, or other machinery, there is a "commutator" or "collector rings." The commutator is a device on the shaft by which the currents generated in the armature are furnished to the external wires or circuit always in the same direction. Such a dynamo is called a "direct-current" dynamo or for short a "D.C." dynamo. In another type of dynamo, simple collector rings are used to lead the current of the machine to the external circuit; in this type the currents are reversed in direction many times in a minute. Such dynamos are called "alternating-current" dynamos or "alternators." The parts resting on the revolving commutator or collector rings are called "brushes" and are usually made of gas-carbon.

Practically all large dynamos used in modern power plants are alternating current machines. There are several reasons for this general use of alternating currents, but the principal reasons are that by the use of the "transformer" (*see* Transformer) alternating currents can be changed to suit conditions of service, smaller wires can be used in the transmission lines, and the alternating-current motors are simpler and more reliable than the direct-current motors. Alternating currents with 60 reversals of direction per second, called 60-cycle currents, are commonly used in our power stations.

Dynamos are rated in kilowatts, "K.W.," a 75 K.W. machine having the same power as a 100-horse-power engine. Dynamos as large as 50,000 K.W. are used.

E

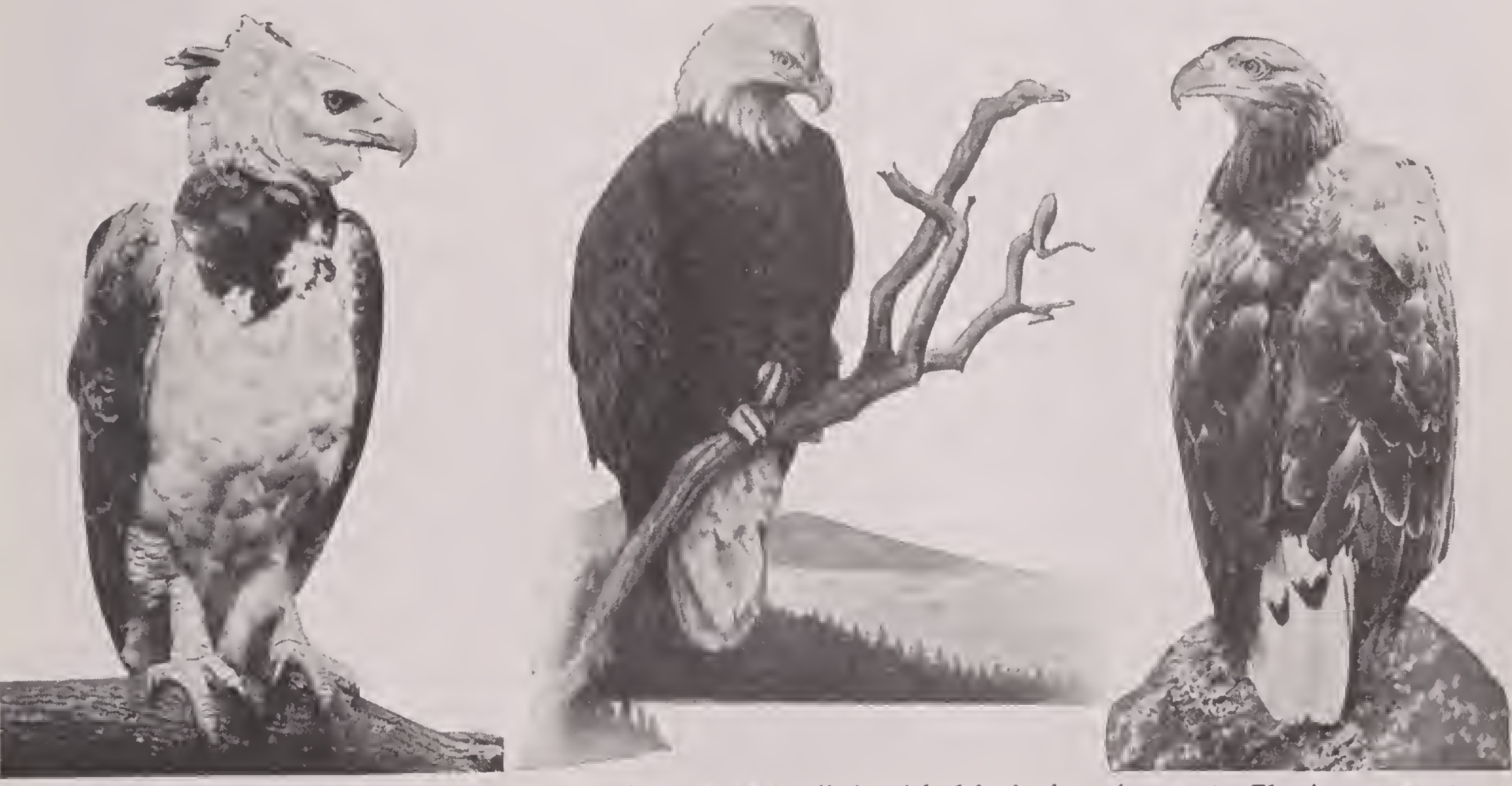
EAGLE. Soaring high in the sky, or swooping like a thunderbolt on the hapless prey it has descried from afar, the eagle well deserves its reputation as "the king of birds." Its extraordinary power of sight, the terrifying majesty of its appearance, and the wild grandeur of the scenery in which it loves to build its aerie, have made it the universal emblem of might and courage from the most ancient times. Five thousand years ago the Sumerians of the city-kingdom of Lagash in the Euphrates valley used the "spread eagle" as the symbol of their power, as did imperial Rome, and as the United States does today. The coats-of-arms of the former Russian and Austrian empires bore double-headed eagles.



Here is a young Golden Eagle with his curious "third eyelid" drawn over his eye. It is a semi-transparent membrane, which probably protects the eye against the sun's glare.

In the words of John Burroughs, the American naturalist, the eagle "draws great lines across the sky; he sees the forests like a carpet beneath him; he sees the hills and valleys as folds and wrinkles in a many colored tapestry; he sees the river as a silver belt connecting remote horizons. We climb mountain peaks to get a glimpse of the spectacle that is hourly spread out beneath him. Dignity, elevation, repose, are his."

THREE FIERCE MONARCHS OF THE AIR



At the left is the Harpy Eagle of Mexico and South America, easily distinguished by its imposing crest. The Aztecs called this bird the "Flying Wolf," because of its ferocious disposition. In the middle is the Bald Eagle, or American Eagle, one of the noblest of all birds. It belongs to the Sea-Eagle group. At the right we see the Golden Eagle, famous for its graceful beauty and exquisite coloring.

There are 40 or 50 species of eagles in all countries of the world, but only two kinds occur in North America. These are the golden eagle common to Europe, Asia, and America, and the bald eagle which is peculiar to North America, and is taken as the national emblem of the United States. All eagles are birds of prey, and are related to the vultures, hawks, and falcons. They are supposed to attain great age. Their nests are structures of sticks, sometimes six feet across and six feet high, containing a cart-load or two of material.

The golden eagle is a magnificent, mountain-loving bird. It is found in the United States from Mexico northward, but is far from common. It is more abundant in the Old World, but even there the sea-eagle is more common. The golden eagle is a large bird of

A DANGEROUS PLACE FOR A NURSERY

The mother Eagle often builds her nest on some wind-swept ledge of rocks rising sheer out of the sea. Here the young eaglets are brought up, feeding on fish captured by their parents. From the time they open their eyes, they are trained to look down from dizzy heights. Since no other beast can or dares climb to their nursery, they never learn fear. We may imagine they are brought up to look upon the world as their kingdom. Their first venture into the great world outside comes when they jump from the dizzy cliff to try their inexperienced wings. Then it is "fly or die" for them.

For any subject not found in its alphabetical place see information brownish color, the feathers of the head and neck appearing golden in the sunlight. It attains a length of three and one-half feet and nine feet in spead of the wings. Its food is hares, ducks, lambs, small pigs and the young of other animals, which it carries away in its talons. It lays two or three whitish eggs with brown spots, usually on inaccessible cliffs.

The bald eagle belongs to the group of the sea-eagles. It is found on rivers and lakes and especially along the seacoast. It is slightly smaller than the golden eagle, having an expanse of wing of about eight feet. The feathers on the head and upper part of the neck are white, which gives it the name "bald eagle." It feeds largely on fish, and loves to rob the fish-hawk or osprey, frightening the osprey into dropping the fish which it has caught, and then diving after the falling fish and catching it before it reaches the earth. Bald eagles usually nest in high trees, and lay two eggs of dull white color. (For illustration in colors *see* Birds.)

Scientific name of bald eagle, *Haliaetus leucocephalus;* golden eagle, *Aquila chrysaetus.*

The STORY *of* "OLD ABE" *the* WAR EAGLE

A LONG time ago a band of Chippewa Indians went into camp to make maple sugar. The braves and squaws and little papooses were all in the woods having a fine time. It was in northern Wisconsin, in March, so the weather was still cold.

But anybody could tell that spring was coming. Snow was melting in sunny places; and robins, bluebirds, and song sparrows were beginning to arrive. Black bears, foxes, and squirrels were coming out of winter dens with their furry babies, and every mother deer was followed by a pretty spotted fawn, for that part of the country was then very wild and woodsy.

The chief of this band of Indians was named Blue Sky. One day he took his gun and got into his birch-bark canoe to go hunting. He paddled down the Chippewa River, which turned and twisted through the dark forest. In one place it foamed over rocky falls. Then it widened to a quiet lake that was full of fish. Just as Blue Sky came to the lake, an eagle rose with a fish in his claw. He watched it fly to its nest in the top of a tall pine tree and feed its young.

It was an American bald eagle. The feathers on its head and neck were a grayish white. When full grown this bird is as big as a Christmas turkey, and it has long strong wings, fierce eyes, a big curved beak, and wicked-looking claws.

Chief Blue Sky chopped the tree down and caught one of the young eagles and took it home in his canoe. He fed it on fish and fresh meat, and it soon became tame. Then Blue Sky sold the eagle to a white man for five bushels of corn. The Civil War began about that time, and the 8th Wisconsin Volunteers thought it would be fine to take a real live "Bird of Freedom" to the war; so they bought the eagle for $2.50.

At first the eagle walked all around the camp just like a puppy dog, and like a dog it chose a master. It took a great fancy to an Irish soldier named Jimmie McGinnis, and would not allow anyone else to feed it.

Jimmie made a red-white-and-blue shield for the eagle's perch. He set this on a pole and tied the eagle by the foot, leaving the cord long enough so that the bird could fly a little way. When the regiment went on the march Jimmie carried the eagle beside the color bearer. The eagle was cheered by crowds of people in every town. In the state capital it was named "Old Abe" for President Lincoln.

By that time "Old Abe" had grown to be a big bird. His coat of feathers was a beautiful chocolate brown. It had golden lights that gleamed like copper in the sun. His tail feathers were white, with black spots. His legs were bright yellow and his claws a shining black. His head and neck were a grayish white. He weighed only 10½ pounds, but when he was angry or excited he ruffled his feathers until he looked twice as big. His wings when spread measured 6½ feet from tip to tip.

"Old Abe" never liked boys or dogs, because they teased him. When he saw a boy or dog he jumped up and down and screamed and flew at him. But he loved marching soldiers and cheering and music. When the band played he flapped his wings and made a whistling sound. He liked to sit on an officer's horse to watch a parade. The officers of the regiment always saluted him.

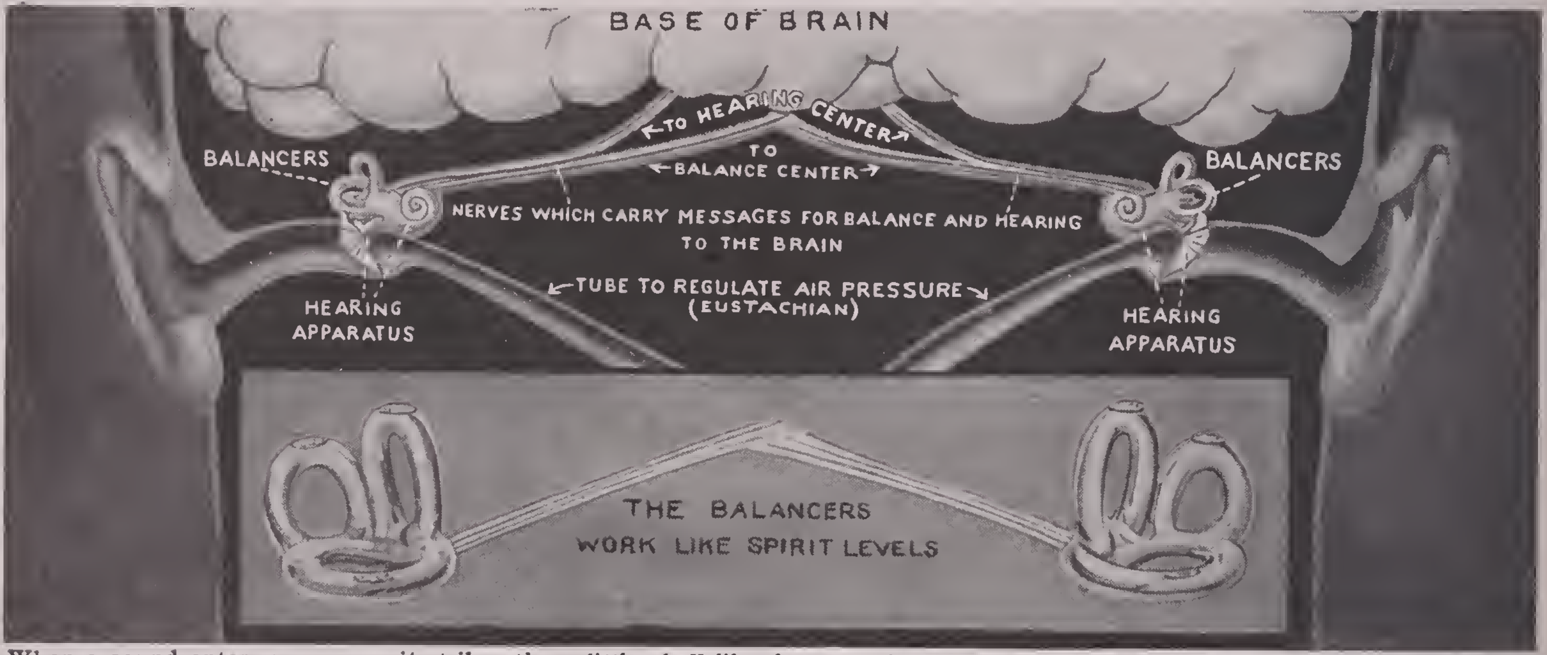
A battle excited "Old Abe." The very first time he heard a cannon shot, he broke his cord and soared away. The soldiers thought he was gone forever. The smoke hid him, but amid the booming of the big guns they could hear his screaming. After the battle was over he circled the sky. Then he dropped to his perch. Whistling and chuckling and ruffling his feathers, he walked and fluttered all around the camp. He seemed to say: "Well, boys, that was quite a battle, but we licked them!"

After that "Old Abe" was not tied. He often left his perch to go fishing or hunting. He seemed to know that he was a heavy burden for Jimmie to carry. Now and then he would lean over and chuckle a sort of good-bye. Then he would soar aloft, and fly above the marching regiment. The boys always cheered him when he came home again.

"Old Abe" went through four years of the war. He was in 22 battles in all, and after every one of them he returned to his own regiment. He never made a mistake and dropped into another camp. His perch was often hit by bullets and several times his feathers were torn, but he was never badly hurt.

After the war "Old Abe" was given to the State of Wisconsin. For 15 years he lived in the State House in Madison. In 1876 Jimmie McGinnis took him to the Centennial Exposition in Philadelphia, and there told the famous eagle's story and sold his photograph to thousands of admiring visitors. Jimmie remained his keeper until the bird died of old age in 1881. The skin was then stuffed and "Old Abe" was set up on his old perch, in a handsome glass case, looking just as though he might spring up at any moment and soar far up in the sky, as in the long past days of the Civil War. He was one of the sights of the city until the State House was burned.

How YOUR EARS CARRY MESSAGES *to Your* BRAIN


BASE OF BRAIN
TO HEARING CENTER
TO BALANCE CENTER
BALANCERS
BALANCERS
NERVES WHICH CARRY MESSAGES FOR BALANCE AND HEARING TO THE BRAIN
TUBE TO REGULATE AIR PRESSURE (EUSTACHIAN)
HEARING APPARATUS
HEARING APPARATUS
THE BALANCERS WORK LIKE SPIRIT LEVELS

When a sound enters your ears, it strikes those little shell-like drums and sets them vibrating. The vibrations are then passed on to the set of nerve fibers which carry them to the hearing center in the brain. The Eustachian tubes open downward into the throat, and keep the pressure on both sides of the drums equal, so they can vibrate freely. But do you see those curled tubes marked "balancers"? They are the semicircular canals and have nothing to do with hearing. Their work is to tell you when you are "right side up." The enlarged picture of them at the bottom shows you how they are filled with a liquid, which flows back and forth as you tip your head. Delicate nerves in these tubes feel the liquid move and telegraph your brain instantly: "Head tipping to right," "Head upside down," and other such information. This "sense of balance" is especially valuable to aviators and acrobats.

EAR. Just read the first paragraph of this article out loud. You and those around you "hear" something. This article is intended to make clear *how* you hear. What you hear is "sound," and if you turn to the article on that subject you can learn about it.

The ear is divided into three parts, called the external, middle, and internal ear. The external ear includes the part you see attached to the head, and also the tube (meatus) that leads back into the head. These parts are not the essential hearing parts, although the tube is important for conducting the sound back to the ear drum or middle ear. If ear wax accumulates in the tube you cannot hear so well because the sound cannot get in.

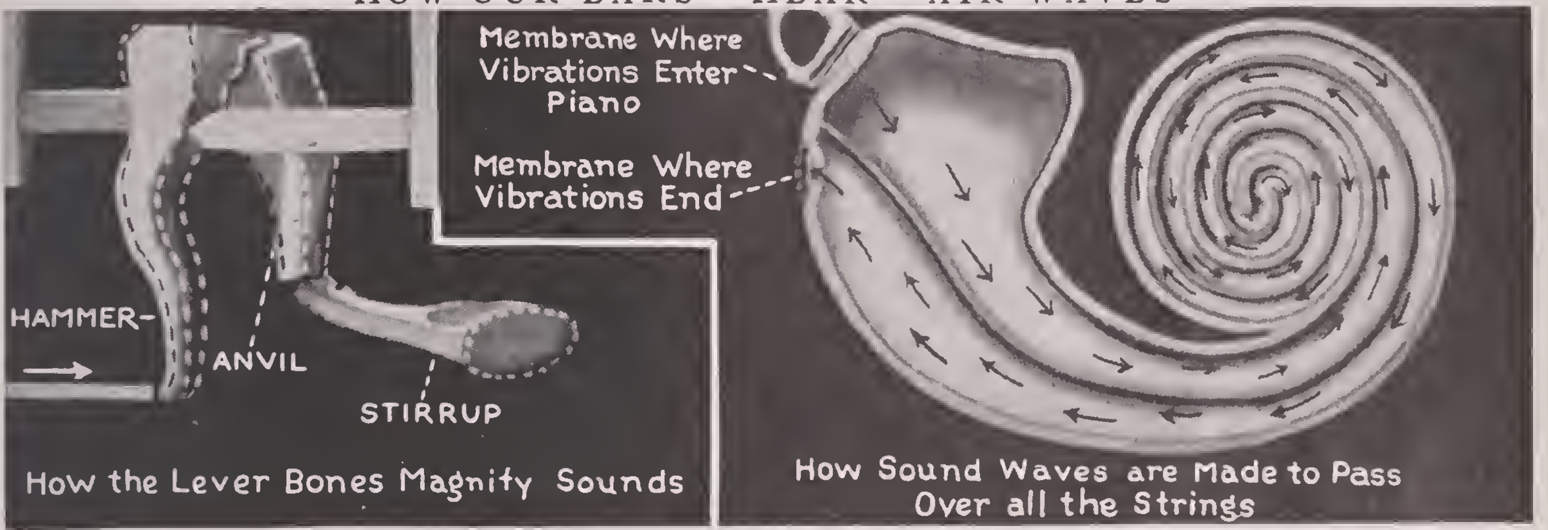
At the inner end of the tube a skin-covered membrane is stretched across and closes the tube. This is the "tympanic membrane" or drum-head. The middle ear or complete ear drum consists of the drum-head and the space and structures just inside of it. The space of the middle ear is filled with air. It is connected with the throat by means of a tube called the Eustachian tube. This is very important, for it lets air into and out of the middle air just as a bass drum has a small hole in the side for the same purpose.

If the Eustachian tube is properly open the air pressure will be the same on both sides of the drum-head and the latter will be able to vibrate readily. If the tube becomes stopped up you cannot hear so well, because the drum-head cannot vibrate as it should. Colds, which are really bacterial diseases, often swell up the walls of the Eustachian tube so that air cannot enter.

This tube is also a frequent place of entry by which germs get up into the middle ear and thence into a cavity in the skull bone called the "mastoid," setting up inflammation and injuring the middle ear, if not worse. Hence the Eustachian tube is to be guarded in every way. One way to guard it is to avoid violent blowing of the nose, which may force infective material back up the Eustachian tube.

If you hold the mouth and nose closed and go through the motions of blowing gently from the lungs you can feel air go into the middle ear through the Eustachian tube. If you swallow, afterwards, you can feel the excess of air go out again.

HOW OUR EARS "HEAR" AIR WAVES


Membrane Where Vibrations Enter Piano
Membrane Where Vibrations End
HAMMER
ANVIL
STIRRUP
How the Lever Bones Magnify Sounds
How Sound Waves are Made to Pass Over all the Strings

Behind the ear drum are bits of living machinery, which do most of the work of "hearing" for us. On the left-hand side are three delicate bones, all three of which do not weigh more than one-hundredth as much as a 5-cent piece. The "hammer" bone receives pulsations from the ear drum, and sets the "anvil" vibrating, which in turn passes on the motion by a lever action to the stirrup bone. The foot of the stirrup bone fits into an opening in the inmost ear or "piano," as you can see at the upper edge of the right-hand picture. The vibrations set up in the stirrup are carried, as shown by the arrows, through a delicate fluid over the "sounding strings" of that snail-shell coil, which is called the "labyrinth." These strings or nerve-ends in turn transmit the messages to the brain.

There is a chain of very small bones suspended in the space of the middle ear. One end of the chain rests against the drum-head. There are three bones, and in all they weigh only about one one-hundredth as much as a nickel coin. When the drum-head is struck by sound waves, it vibrates and sets these extremely light bones into similar vibration. The ear bones have interesting names. On account of fancied resemblances to those implements, they are called the "hammer," "anvil," and "stirrup."

Now we come to the most difficult part of the ear to understand, the inner ear. There is first to be considered the so-called "bony labyrinth," which is a group of minute connected chambers and passages in the temporal bone. These are filled with a liquid called "perilymph." In two places these chambers, and consequently the perilymph, are separated from the middle ear only by small thin membranes. One of these is called the "oval window," and the inner end of the chain of bones fits in there. So you see when the bones vibrate they cause the liquid in the inner ear to vibrate also.

The next thing to consider is the "membranous labyrinth." This consists of thin-walled flexible tubes and peculiar enlargements suspended in the bony labyrinth and surrounded by the perilymph. These tubes are filled with liquid called "endolymph." Now, at certain places on these membranes the nerve fibers or minute individual strands of the auditory nerve have their endings, which seem to be essentially very delicate hairs suspended in the endolymph. When the endolymph vibrates these hair cells are stimulated, nerve currents or impulses are aroused in the nerve fibers and travel back to the brain, and arouse or stimulate the part devoted to hearing; and at that moment we say we hear the sound.

We have to note that the vibrations of the air, or physical sound, do not reach the brain at all. It is the nerve currents or impulses that stimulate the brain. The nerve currents are aroused by the vibrating liquid; this is set going by the chain of bones, and these by the sound waves. But every stage in the process up to the point of stimulating the nerve endings corresponds in respect to time, intensity, and number of vibrations with the original sound. How then can we hear so many different tones? It is believed that the inner ear is so constituted that each pitch of a tone stimulates only one nerve fiber. For example, if you should strike middle C on the piano, one fiber would take the message to the brain and arouse the sensation of middle C. If you strike another string, a different hair cell vibrates; a different nerve fiber takes the message; the brain is stimulated differently, and we recognize the different tone.

In addition to the "cochlea" (which is the name of that part of the inner ear by which sounds are recognized) there are the "semicircular canals" and related parts. These also have sensory nerve fibers ending on them. However, they have nothing to do with hearing. Rather these nerve endings and fibers are stimulated by the force of gravity and by motions of the body. Consequently they give us information with reference to the position of the body and help in equilibrium. Persons with diseases of these parts of the ear are dizzy and often fall down.

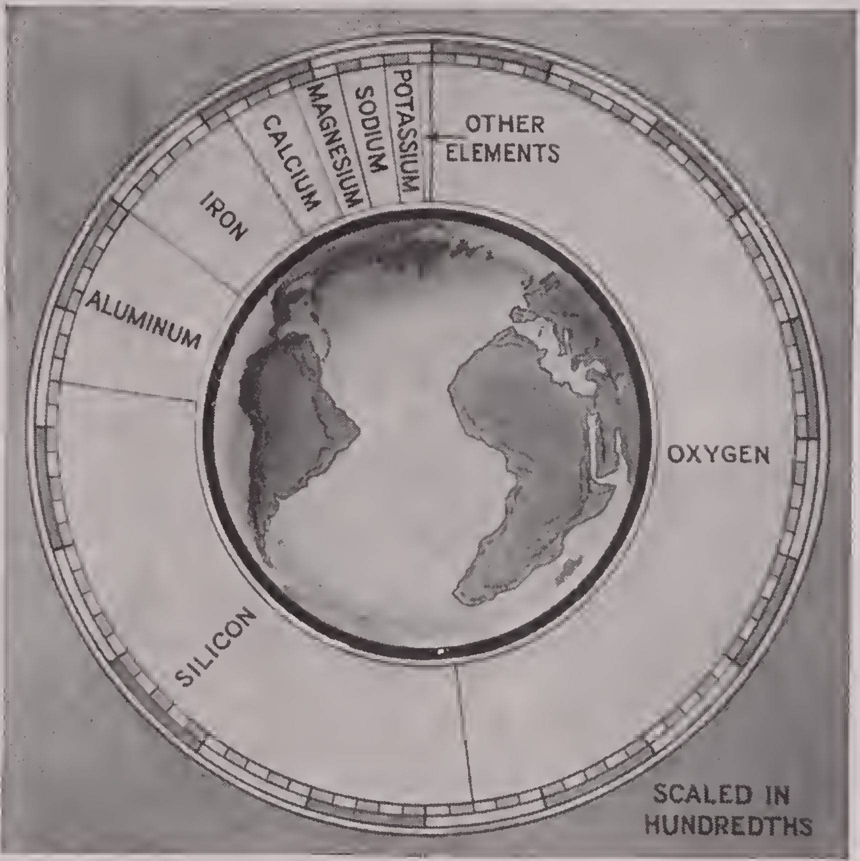
OUR GLOBE *and its* WONDROUS STORY

OUT of a whirling mass of red-hot gas, or of world-dust, our Earth must have come—over 100,000,000 years ago. As it slowly cooled Life appeared in its seas, and crept onto the lands, until Man, in God's own image, mastered the world. What we know about the Earth as a member of the Solar System and one of a billion heavenly bodies in the boundless Universe, is briefly told in this article.

EARTH. Out of some vast cloud of fire our Earth may have come; that is as far as we can get in our search for the birthplace of the world we live in. Far out in space today we see great worlds being fashioned still; we see such mighty spectacles as that nebula of Andromeda, filling space for millions of miles with incandescent light, and we know that from this cloud new worlds are now evolving. Perhaps out of a nebula such as this came the Earth.

Farther back in time than we can think, in that case, our Earth was a cloud of fire, a red-hot shapeless mass. The stuff that we are made of was in that cloud, whirling through the vastness of space. As the cloud spun through space, showers of red-hot rain and tides of red-hot lava pouring over it, it cooled and shrank, and parts of it must have been whisked off like raindrops from an umbrella. In the course of ages that no man can number, the cloud of fire became a globe of gas, the globe of gas cooled down outside, the stuff that made it shrank up into itself, and out of it, in various wondrous ways, came Earth and Air and Sea, and all that therein is.

WHAT THE EARTH'S CRUST IS MADE OF



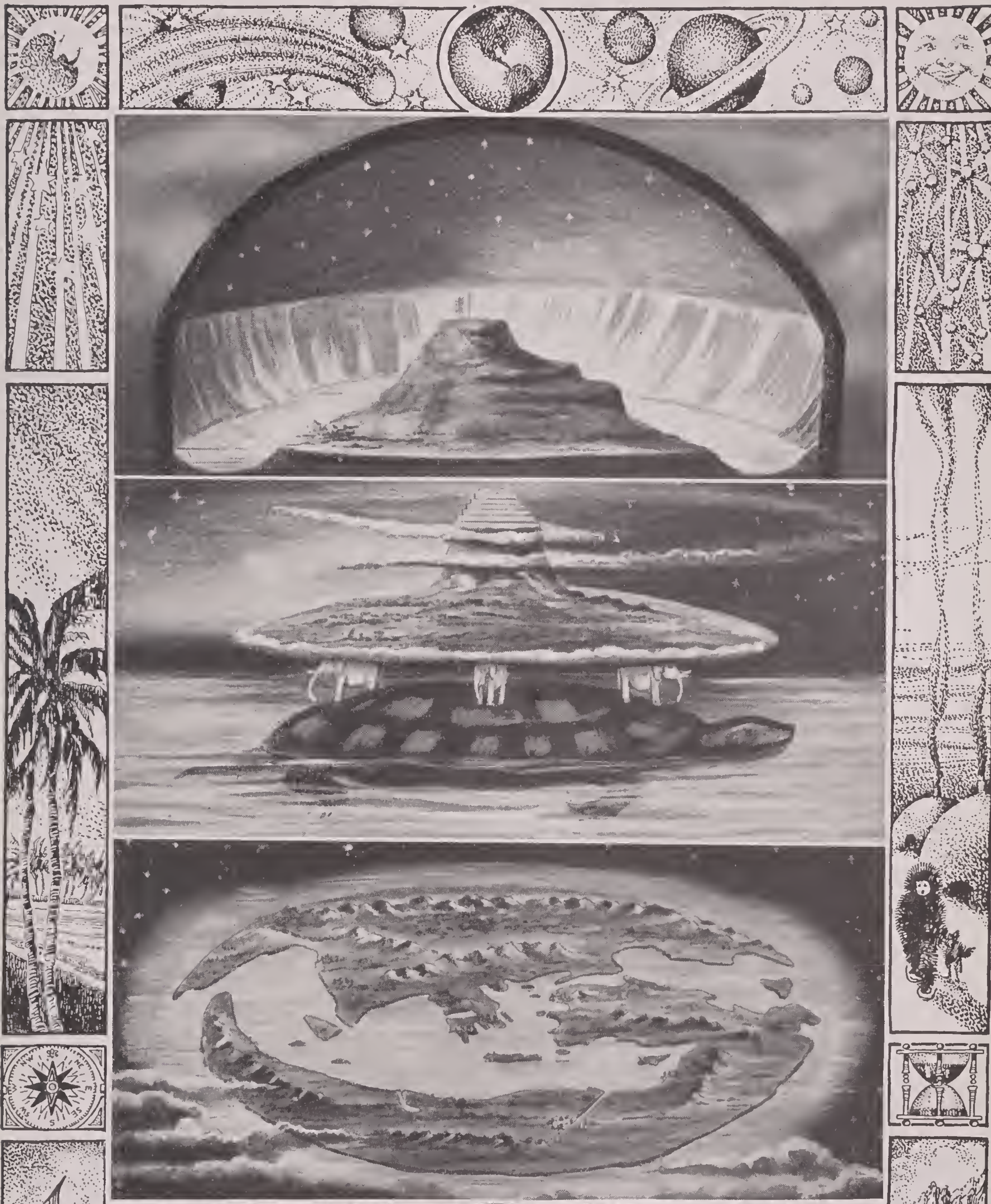
The white band around the globe represents the Earth's crust. The divisions show the principal elements that compose it. Oxygen, you see, is by far the commonest; Silicon is next; and then Aluminum, Iron, and so on. Notice what a narrow strip is left for the 75 or more "other elements."

That is what most scientists believed, until recent years, about the origin of our Earth. Now, however, many scientific men modify this "nebular hypothesis" into what is called the "planetesimal theory," and regard the Earth as arising by the coming together or "capture" of many particles by a central mass. (*See* Nebulae.) But there still remains much of truth in the vivid picture, drawn by a French scientist, of the Earth as it must have been in those wild fierce days of lightnings and thunders, of earthquakes and volcanoes, and of seas of molten metal rolling in red-hot cauldrons. This is the picture he draws of the way in which our Earth was slowly shaped from the nebulous mass:

"When the temperature was lowered sufficiently to enable them to pass from a gaseous to a liquid state, metals and other substances would fall down in a fiery rain on the terrestrial lava. Next the steam, confined entirely to the higher regions of the gaseous mass, would be condensed into an immense layer of clouds incessantly furrowed by lightning. Drops of water, the beginning of the atmospheric ocean, would begin to fall down towards the ground, but only to volatilize on their way and again ascend. Finally, these little drops reached the surface of the terrestrial mass, the temperature of the water much exceeding 100 degrees, owing to the enormous pressure exercised by the heavy air of these ages; and the first pool, the rudiment of a vast sea, was collected in some great fissure of the lava. This pool was constantly increased by fresh falls of water, and ultimately surrounded nearly the whole of the terrestrial crust with a liquid covering; but at the same time it brought with it fresh elements for the constitution of future continents. The numerous substances which the water held in solution formed various combinations with the metals and solids of its beds; the currents and tempests which agitated it destroyed its shores only to form new ones; the sediment at the bottom of the water began the series of rock and strata which follow one another above the crust."

The Earth, then, according to this view, came from a fiery cloud of gas, cooled down and became solid. Where the cloud of gas came from, no man can say. We know that space is full of such clouds, and it is possible that our Earth was once upon a time just such a handful of fire in a whirl. It is thought that the whole Solar System, to which the Earth belongs, may have begun in some such way as this. When two

SOME ANCIENT IDEAS ABOUT THE EARTH



What a puzzle the earth has been to men! The picture above shows three of the fanciful ancient explanations of it. The top picture represents the old Chaldean idea, that the earth was contained inside a sort of chamber whose walls rose from the sea and whose ceiling was the arching sky. The middle picture shows the ancient Egyptian belief, that the earth rested upon four elephants, which stood in turn upon a gigantic tortoise, swimming in a gigantic sea. The bottom picture shows the notion held by the older Greeks, that the earth was a flat disk, surrounded by the ocean.

great suns rush past each other in the universe they must tug at each other at terrific speed and with inconceivable force, and it is believed that by the force of gravitation these two suns must pull so hard that one of them would inevitably tear into pieces, smash up into gases and stones and rocks, all revolving in a mighty mass with a sort of central core, surrounded by clouds of fiery gas. Fragments of the broken sun would fly round and round and slowly collect into red-hot globes, and in time there would come about a system like our own—a sun with planets circling round it.

So the Earth and the entire Solar System may have come out of the depths of space, and it is a sublime and thrilling thing to think of Mother Earth with such a past—pulled by gravitation out of the fragments of a sun, twisted and torn by another sun passing by.

At all events the Earth must at one time have been a mass of molten rock, and its spinning through space from age to age would shape it like a ball as it was cooling down and slowly hardening. A crust of lava and other broken rocks would form outside, and there would be unthinkable spittings and fumings of molten metal, steaming and boiling and bubbling in every quarter of the globe. The crust would shake with the splittings in the Earth and the terrific wrenchings inside it, and volcanoes would throw out, night and day, stupendous quantities of stones and steam and gas and fire.

One day in the history of these convulsions the Moon may have broken off from the whirling Earth. It is believed that the tug of the Sun may have shattered the slowly cooling crust and torn huge fragments out of it, and one of these fragments, it is thought, may have been the Moon. A great mathematician has calculated that as the Earth cooled down, it must have assumed the shape of a pear, and as the mass spun round and round in space, the point of the pear may have flown off. If this did happen, our mathematician says, there would be left a huge hole about 27 miles deep, and he believes that in this hollow bed the vast Pacific Ocean now rolls. Think of that stupendous conception—the Moon broken off from the Earth to travel round it for ages and ages, and to look down upon the bed it made when it broke away, seeing there 60 million square miles of rolling waves, the vast Pacific, bearing the commerce of the world!

How long ago all these things happened we can only guess, but many ingenious calculations have been made. It would seem that the Earth must be at least about 100,000,000 years old, and probably a great deal older. The Moon, the mud changed into rocks, the amount of salt in the sea, and the heat of the Earth have all helped man to form his theories of Earth's age. Let us see how they helped.

How Old is the Earth?

Prof. George H. Darwin tried to find out the age of the Earth by finding the age of the Moon. Once upon a time it was only about 10,000 miles away from Earth; men might have seen fires burning on the Moon; and in those early days the pull of the Moon on the seas was so great that it is thought the tides must have been over 600 feet high. Now the Moon is nearly a quarter of a million miles away, and its tidal action is dying down. Professor Darwin calculates that it must have taken at least 56,000,000 years for the Moon to get so far away, so that we have that distance of time to begin with.

Prof. John Joly tried to find out the age of the Earth from the age of the sea. The waters of the oceans were at first unsalted he believed, and the salt in the sea has been washed out of the Earth and brought down by the rivers. By calculating the rate at which the rivers carry salt to the sea, and estimating the total quantity of salt in the sea, Professor Joly reached the conclusion that it must have taken at least 90,000,000 years to carry that salt to the sea.

Sir Archibald Geikie, the geologist, tried to find out the age of the Earth by measuring the depth of the rocks that were made from mud deposited on the floor of the sea. He came to the conclusion that from the beginning of the Earth the mud accumulated in the sea must have reached a depth of 50 miles, and that the rivers of the world could not have borne down so much mud in less than 100,000,000 years.

Lord Kelvin, a great British physicist, tried to find out the age of the Earth from the time it must have taken the crust to cool, and he believed that about 100,000,000 years was as near the facts as we could get. Since the discovery of radium, scientists have used various phenomena connected with it as bases of calculation (*see* Radium), and obtain results similar to those given above; that is, they computed the age of the Earth as being something over 100,000,000 years. Thus, many different methods point to much the same answer.

How Long is the Earth Going to Last?

We may say, therefore, that the Earth cannot be less than 100,000,000 years old. How long will it last? How long will it be before there comes another day like that on which the Earth was made, when some other sun will rush out of space and tear it to atoms? That is not likely to happen, but what we know must happen is that in time the Earth, like the Moon, will cease to spin, and one half of its surface will be in perpetual darkness and the other half in perpetual light. What is not so certain, though very likely, is that even before then the Earth may cease to be a habitable planet, for it may go the way of Mars and lose the water without which life cannot exist. Or some climatic change, some great extreme of heat or cold, might destroy all existing life.

In any case, we need not trouble over-much about such things as these, for life is humanly certain upon the Earth for millions of years to come, and most of us may consider that long enough. Certain it is that the Earth has not yet reached its final state, for the story of these changes still goes on. The Earth is still being made today, not less than when the twistings in the red-hot globe were forming the ocean depths. Nothing is at rest. All things move with time and tide. The very mountains are crumbling

WHEN EAST MET WEST IN 1521

Although men of science had long been convinced that the earth is a globe, the first undeniable proof of its roundness to the popular mind came when men traveling eastward around the earth met others who had traveled westward. This historic event took place in 1521 on the island of Tidore in the Malay archipelago. The Portuguese had established themselves there several years before, after sailing around Africa; and members of Magellan's crew met them after sailing around South America.

into dust, and the ocean depths rise slowly from the sea. Tennyson's poem is true science:

> There rolls the deep where grew the tree,
> O Earth, what changes thou hast seen!
> There, where the long street roars, has been
> The stillness of the central sea.
>
> The hills are shadows, and they flow
> From form to form, and nothing stands;
> They melt like mists, and solid lands—
> Like clouds they shape themselves and go.

But how did it happen that this huge lifeless globe became alive? That is one of the many questions that science cannot answer. Lord Kelvin suggested that life may have been borne to Earth on some fragment of another world arriving here as a meteor; but the suggestion takes us no farther and solves no mystery, for how did Life come to be upon the meteor? What we believe we do know is *where* Life was born; we believe it must have been born in the sea.

Until the seas were made there could be no food for Life, for Life must have water; nothing can live without it. In the great waters that cover nearly three-quarters of the Earth, this wonderful Life was born, and there came a day when Life swam ashore.

Now let us realize a striking thing. When the red-hot cloud was whirling through space, parts of it broke away, and one of these parts became the Moon. Ages passed away, the oceans were formed, and the action of the Moon caused the waters to rise and fall; and it is easy to imagine that this rising and falling of the waters was the very thing Life wanted when it began in the sea. For Life, washed ashore by one tide and carried back by another, would grow used to the land without a sudden change. On the land Life found the oxygen it needed.

The history of living things from then till now is a wonder that men give their lives to understand; we can only give a minute to it here. Let us imagine that we are still at school, writing an essay on the Rise of Life. We should write something like this:

"Once all creatures lived in the sea, and the first of all were only soft things like jelly, with no bones. These had the sea to themselves for a very long time, and slowly they grew into separate families, unlike those that had gone before. Then, on the land, great forests grew, and a new kind of animal came. In the waters were great sea-serpents, fish with skins like iron, and huge animals that could live either on land or sea. Some could fly and swim, some could eat off the tops of trees. Now the first birds came, and flying dragons. Great land monsters grew up, and the mastodon fought the savage tiger with teeth like swords. Slowly the world grew into the kind of place it is today; the animals became like those we know; and at last came man, lord of all the earth, living in trees and caves, with the wild beasts about him."

Where Did Life Come From?

In some such way as this did the world begin; in some such way did it become alive. Far back in that strange time were the dim beginnings of the world we live in. It is not easy for us to throw ourselves back to the time when man battled with the beast for the mastery of the earth, when man lived in caves and trees to save themselves from wolves; but the marvel of our own life today is infinitely greater if we think of it in connection with these strange beginnings.

The Earth a Tiny Speck in a Boundless Universe

Let us remember that, whatever we may be reading about in this book, whether newspapers or flying machines, nations or empires, it is all happening on a ball that is flying about in space. We look out upon the Earth and think it infinitely great, and we do right to think it great; but we look out upon the universe, and our Earth becomes infinitely little in comparison. (*See* Astronomy.)

Think for one moment of this wonderful ball—stand and think of it on one of our own hills. Beyond you lies the city, with its busy stream of traffic passing through the streets—hospitals and churches, the shops with all their busy life, cabs and street-cars and motor-cars, men coming and going, children playing; the railways with all their traffic, the prisons with all their tragedies, the schools with all their problems, the homes of the rich with all their luxuries, the homes of the poor with all their miseries. And in all that scene, as you stand there, you are a speck.

Think that the sight you see is one of a thousand such sights in your town, that your town is one of a thousand places in America, that America is only one of five continents that make up the Earth, that all the continents together are smaller than the oceans.

Think of the seething cauldron called Russia. Think of the Far Eastern countries—China, India, Japan; of Australia beyond; of Europe, of Africa, of the British Empire; of the Suez and the Panama canals, of the Mediterranean bearing the commerce of the East towards Europe, of the ships and railways all over the world; of the Alps, and Niagara, and the Pyramids. And remember that the United States is only one among many nations.

Wonders of Life on the Wonderful Ball

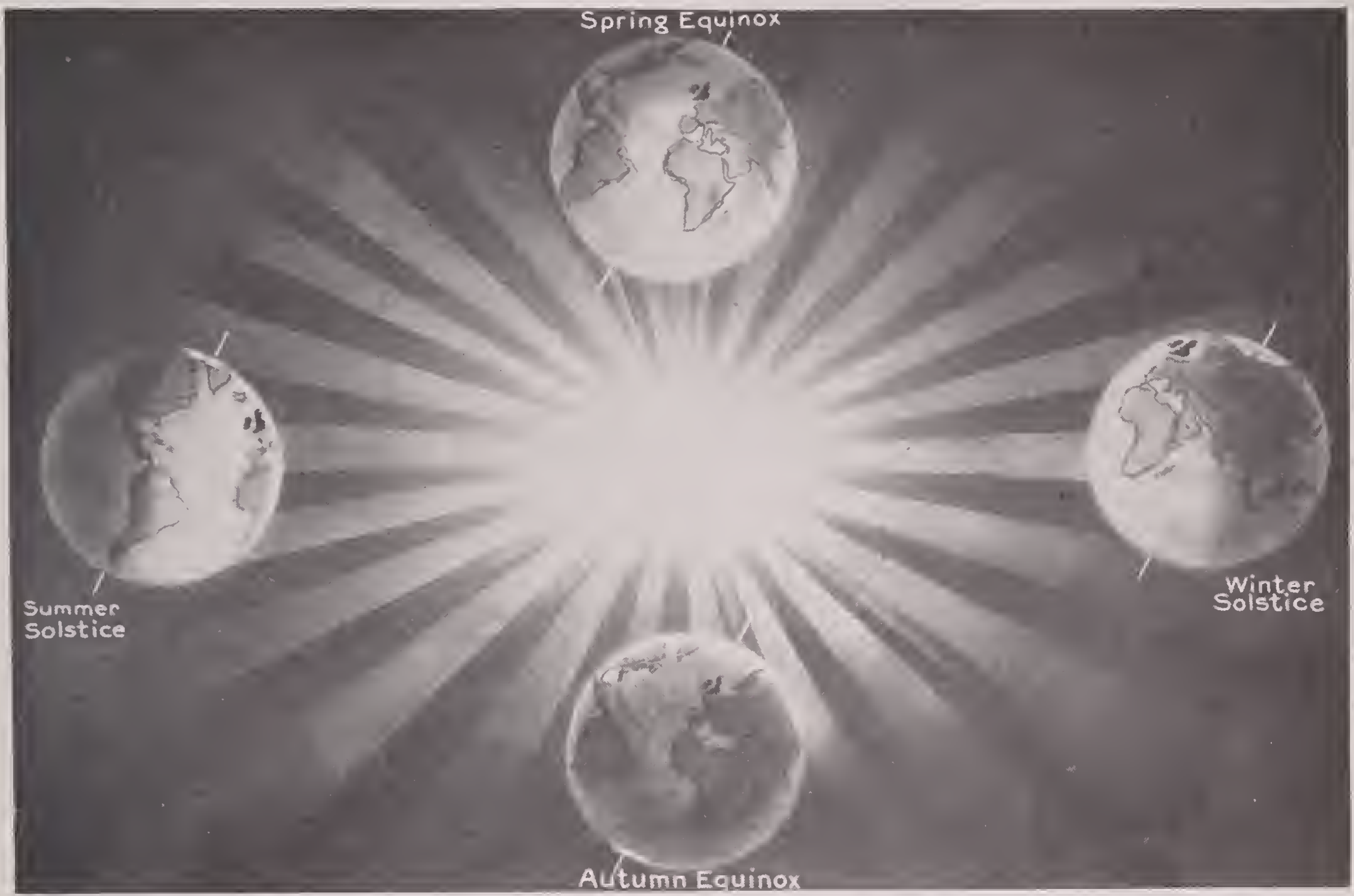
And then remember this—that as you stand there you can see a mile, or two miles; that the Alps are only a few thousand miles away: and yet, as you stand there in the sunshine, you feel the warmth of a fire that burns nearly a hundred million miles away, and you remember that the Sun is the center of our system, from which our Earth draws light and life. And in this system the Earth itself is but a speck.

The Sun is one of millions of suns, the world is one of millions of worlds; and you stand on this spot, an atom of humanity, a speck in a scene which, in the vastness of the universe, is in itself as a grain of dust!

The Earth is a speck! Let us magnify its size and say it is a baseball. Picture the baseball flying through space, and think that *America is there!* Think that *Europe is there!*

Picture the ball, and think that it has been flying in space since you were born—a hundred years, a thousand years, before the first man. Think that Egypt was there, and Babylon; that Greece and

WHY SUMMER COMES BUT ONCE A YEAR



Here you see why we have the four seasons and why days and nights are constantly changing in length. Since the earth's axis is tilted, first one hemisphere and then the other is turned toward the sun as the earth travels in its orbit. At the Winter Solstice (mid-winter) the north pole is tilted away from the sun and the northern hemisphere receives less heat, because the rays of the sun reach it more obliquely. The more oblique the sun's rays become, the less heat they afford, because they are spread out over a greater extent and hence their effect on any given spot is proportionately less. Notice in the picture how much less space on the earth's surface is covered by the nearly vertical rays which reach the equator than by the slanting rays which strike toward the poles. Notice also that a larger part of the northern hemisphere is in darkness than in light; that is, the nights are longer than the days. For the southern hemisphere these conditions are of course reversed. As the earth continues its course about the sun it reaches the position where the poles are the same distance from the sun, and day and night are exactly 12 hours long all over its surface (Spring Equinox). At the Summer Solstice the north pole is nearest the sun and the south pole farthest; hence it is summer in the northern hemisphere and winter in the southern. At the Autumn Equinox days and nights are again equal.

Rome and Bethlehem were there; that Mohammed and Cromwell and Paul lived there; that Shakespeare wrote his plays there; that Cheops built the Pyramids there; that the War of Independence, and Waterloo, and the World War were all there!

Think that that flying ball is America, Europe, Africa, Asia, Australia. Think that the whole history of man has been there; that nothing we know has happened anywhere but on that ball!

Picture the air full of these balls, enough of them flying in space to give one to every human being alive; and remember that you are standing on a hill on one of them! *You are one of millions of living things, on one of the millions of flying balls!*

We have moved a long, long way since men believed that the Earth is flat, and farther still since men believed that it rests on the back of an enormous tortoise. The things we do *not* know about the Earth are innumerable, but what we do know about it is marvelous enough.

It is a great ball of rock about 8,000 miles across. It spins round once every 24 hours, and it travels round the Sun in a ring of 583,000,000 miles, moving at 19 miles a second. It moves, not in an exact circle, but in what we call an ellipse. As it rushes on its way the seasons change, owing to the direction in which the Earth is tilted, and when the Earth has completed a circuit round the Sun, we have had spring, summer, autumn, winter, and we say a year has gone by.

In the course of this long journey round the Sun, the Earth itself has turned upon its axis 365 times and a bit. We call the time in which it spins a day and a night, but the little bit over does not fit well into our reckoning, and so we make a year into 365 days and nights, and use up the little bit as an extra day in each leap year. The actual time in which the Earth turns round completely is 23 hours, 56 minutes, 4 seconds. The rate at which Earth rides through space is about 66,000 miles an hour, a thousand times as fast as an express train. Nor are these the only directions in which the Earth is moving. It spins on itself, it travels around the Sun, but it is also moving away to another position in space, moving with the whole Solar System, of which it is a part. It is believed that we are going towards the brilliant star Vega, in the constellation Lyra, rushing through space towards that point at the speed of 43,000 miles an hour. Every year the Earth is about 378,000,000 miles nearer to Vega, and perhaps in a million years it may arrive.

Nor are these all the movements of the Earth. There is, for instance, the movement by which the Earth changes the direction of its axis. It does not spin straight up and down, as it were, but tilts in varying directions, as if it were a wobbling spinning-top. Just like a top dying down this old Earth spins, and in about 26,000 years it wobbles around a complete circle, all this being due to the attraction of the Sun and Moon.

The more we know of the home of man—this gigantic globe that weighs 6,000 million million million tons (6,000,000,000,000,000,000,000)—the more the wonder of it grows, and yet the Earth is as a speck in the space in which she moves. Truly we may sing with the poet of old who thought upon the marvel of it all:

"Where wast thou when I laid the foundations of the earth? Declare, if thou hast understanding. Who hath laid the measures thereof, if thou knowest? or who hath stretched the line upon it? Whereupon are the foundations thereof fastened? or who laid the corner-stone thereof, when the morning stars sang together and all the sons of God shouted for joy?"

HOW THE EARTH WAS WEIGHED

It is an old question, which men have asked for many years, What is inside the earth? There was once a theory, believed by some people, that the earth is hollow. Others have believed that the earth is made up of melted matter and is fluid except for the outer crust. Still others have thought that the inside of the earth must be very dense and strong, to hold up the mountains and oceans which rest on the earth.

Of course, it is not possible to decide the question directly, because we have never, even in our deepest mines, gone down more than five miles—a mere scratch on the surface of this big ball which we call the earth. But gravitation has given us a method of measuring the quantity of matter in the earth. The first man to do this was Henry Cavendish, about 130 years ago; more recently, Prof. Charles V. Boys of London and Prof. John H. Poynting of Birmingham (Eng.) have measured the earth's mass more exactly. Professor Poynting's experiment was somewhat as follows: He hung a small lead ball on a very fine balance, and got the pull of the earth, that is, the "weight" of the small ball. Then he put under the small ball a big lead ball. This made the small ball weigh more, because the "pull" was that of the earth plus the pull of the big ball on the small ball. Of course this extra weight was very small, but Professor Poynting had a very fine balance and was very skilful, and so was able to measure this extra pull. He knew the distance to the center of the big ball, the mass of the big ball, and the distance to the center of the earth, and so he calculated how much more matter must be in the earth than in the lead ball,—that is, he "weighed the earth." The result of his experiment showed that the earth weighs more than five and a half times as much as a globe of water of the same size.

Some Facts about the Earth

The mean distance of the Earth from the Sun is about 93,000,000 miles; of the Moon from the Earth, about 239,000 miles. The diameter of the Earth at the Equator (7,926 miles) is greater by 27 miles than through the poles (7,899 miles). The circumference at the Equator is 24,902 miles. (*See* Planets.)

Eratosthenes, a Greek astronomer of Alexandria, Egypt, not only taught that the Earth is a sphere, but roughly calculated its circumference 200 years before Christ. He observed that at Syene, 500 miles south of Alexandria, on the day of the Summer Solstice (*see* Equinox and Solstice), the Sun shone vertically into a deep well at noon, while at Alexandria, on the same day, the Sun at noon was 7.2° south of the zenith. From these observations he calculated the whole circumference. This was also one of the first determinations ever made of the latitude of a place (*see* Latitude and Longitude).

The average density of the Earth is about 5½ times as great as that of water. Since the density of the Earth's crust is very much less than this, the density of the center must be very much greater. The heat of the interior is undoubtedly very great, probably great enough to melt and even reduce to vapors the solid substances of which it is composed, if the enormous pressure of gravitation were removed. But as it is, the center of the Earth has been found by recent experiments and calculations to be even more rigid than if it were composed of solid steel.

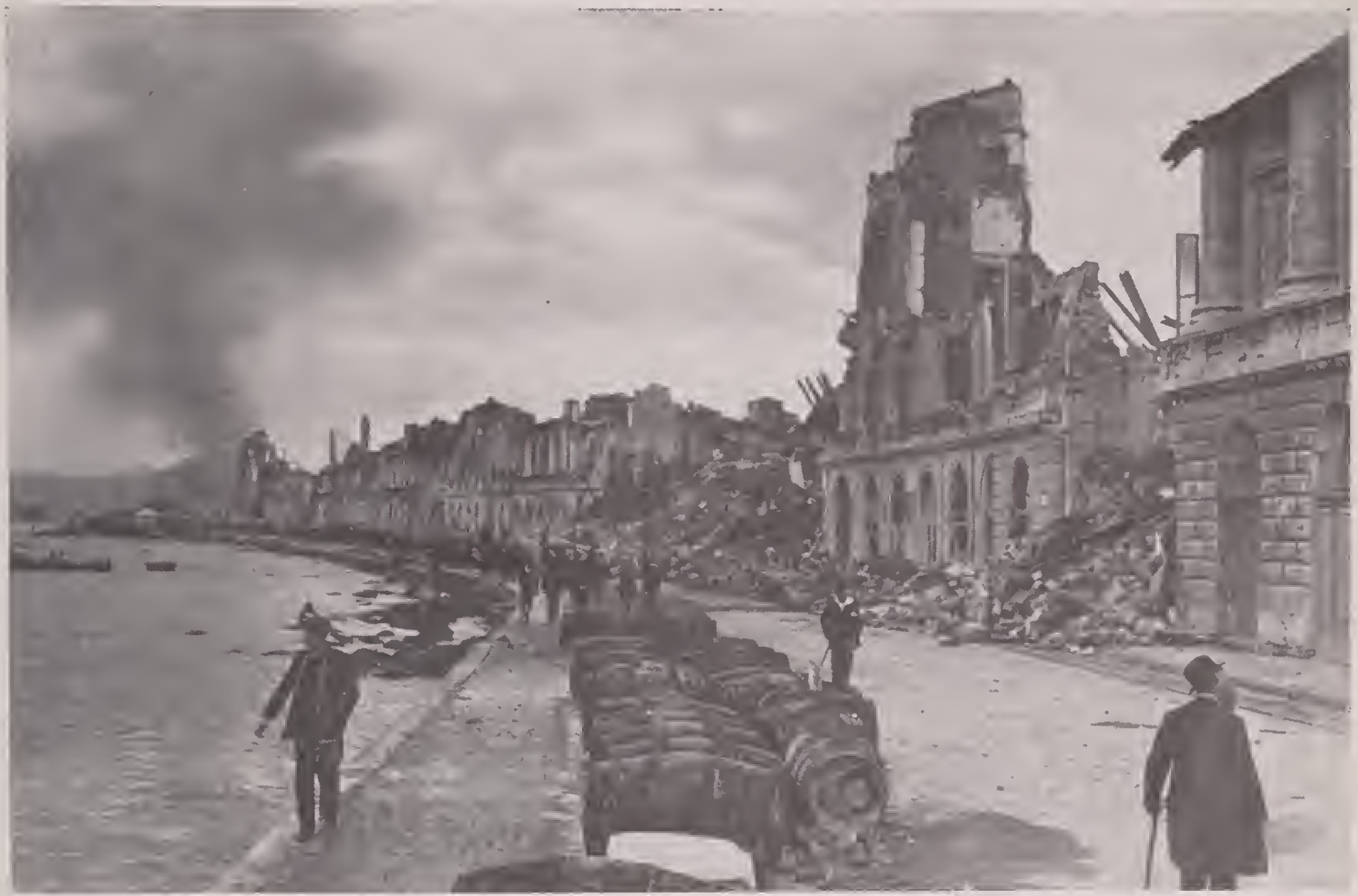
It has long been known that the whole Earth is one huge magnet, with a north magnetic pole at a point 70°5′ north latitude and 93°43′ west longitude; and a south magnetic pole about 72°25′ south latitude and 155°16′ east longitude. But there is a slow change in the location of these magnetic poles, which is shown by deviations in the compass. Measurements of such deviations made in London show that a street a mile long laid out parallel to the compass needle in 1580 would now have its terminus about half a mile too far east. It is believed that the Earth's magnetic axis is rotating about its geographical axis once in about 1,000 years.

EARTHQUAKE. Travelers in Japan often are surprised at finding that all the houses, even the finest hotels, are built of wood. After a few months' residence in the country, they are grateful for the wooden buildings and for the fact that no nails are used. They find that the frequent earthquake shocks would make brick, cement, or stone structures dangerous and that "dove-tailing" makes it possible for a house to be shaken into pieces and to be put together without the loss of life and property which usually accompany such happenings.

Japan is a region of earthquakes. About three shocks a day are recorded on the average, though most of them are too slight to be felt. Earthquakes are common also in a belt which crosses southern Europe and Asia, and along the west coast of the Americas. For some time scientists thought that nearness of the sea had some connection with earthquakes, but this idea is generally abandoned.

Most earthquakes are due to "faulting." The rock formations of the earth, down to great depths, sometimes break, and the parts on opposite sides of the fracture slip up on one another. This slipping movement is a "fault." The eastern slope of the Sierra Nevadas is the result of a fault, the western side having risen, while the one to the east, the "Great Basin," sank. The slip along a great fault fracture does not all take place at once. Rather there are repeated small slips. Though the amount of slipping at one time is slight, a few inches or a few feet, the vibrations set up spread far and wide, and sometimes are very destructive. Chimneys may be hurled to the ground by a slight and sudden shock, just as a marble lying on a floor may be caused to jump into the air by a

WHEN MOTHER EARTH STRETCHES HER OLD BONES



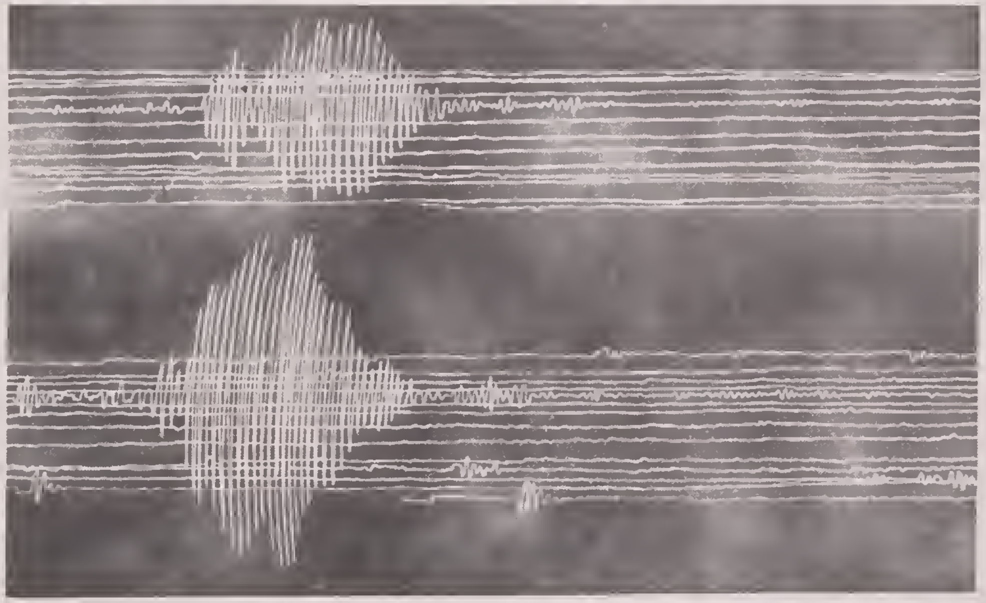
You see in this picture the terrible destruction which a few tremors of the earth wrought in Messina, Italy, in 1908. Measured against the entire earth, the tremors were not as important as a tiny yawn would be to a man; but practically the entire city crashed to the ground, and thousands of people were killed. Such events serve to remind men what tiny creatures we are, compared to the earth on which we live.

slight quick tap of a hammer some distance away. The floor does not move much, though the marble does.

Another cause of earthquakes is volcanic action. Everyone knows what would happen to a boiler if there were no safety valves on it. Volcanoes have to make their own safety valves, and the blowing out of great stream masses often causes shocks. There probably are other minor causes, but all great quakes probably are the result of faulting.

As has been said, even a very small shock may cause serious disaster. When shocks are violent, as in the San Francisco earthquake in 1906, buildings are destroyed and fires are started almost immediately, due to the breaking of gas pipes, displacement of electric wires, etc. When an earthquake movement throws water offshore along a coast, the returning wave sometimes has risen to 60 or even 80 feet. In the Lisbon earthquake of 1755, many thousands were drowned within two minutes. At Arica on the west coast of South America, in 1868, war vessels were said to have been carried two miles inward by an earthquake wave. On low coasts or plains, changes in level due to quakes have caused marshes and lakes to form as in New Madrid, Missouri, in 1811–12.

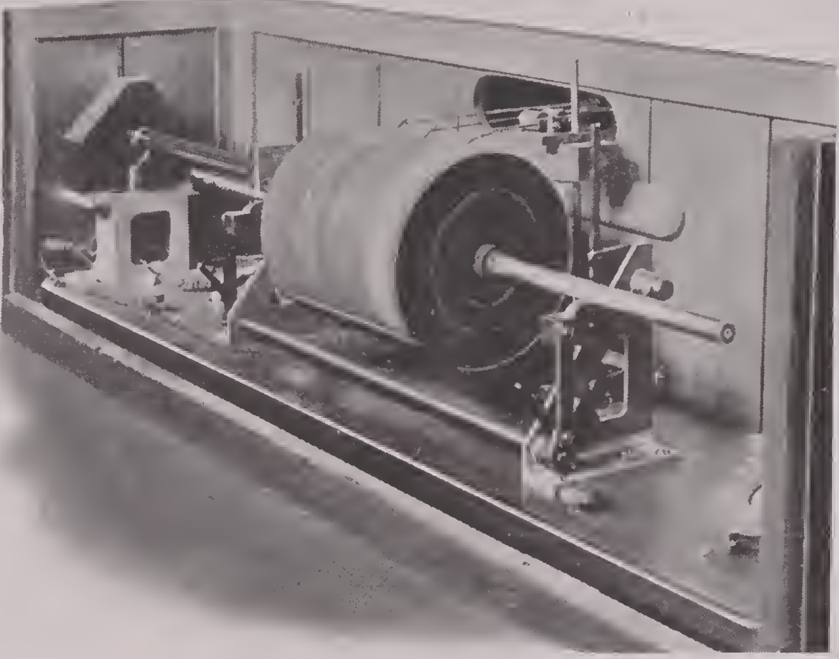
HERE'S THE SIGNATURE OF AN EARTHQUAKE



For all his puniness, man can make the earthquake record itself, and tell where it came from. The illustration shows part of a smoked tape on which one earthquake wrote its story. The tape was run past tracing needles, which were attached to pendulums. When the earth trembled, the tape trembled too, leaving the suspended needles to trace these patterns.

The New Madrid earthquakes of 1811–12 were reported by observers who had no special instruments for recording the shocks. Nowadays, scientists use instruments called "seismographs" for registering and also measuring earthquake vibrations. The commonest form of seismograph consists of a pendulum so supported that it remains stationary, or nearly so, when the earth's crust shakes. A pen or some other recording device attached to it traces lines on a clock-driven roll of paper, which thus registers shocks too slight to be felt.

AN EARTHQUAKE RECORDER



The Seismograph shown above is the machine which records earthquakes. It senses tremors which are far too faint to be noticed by human beings, often making reports of earthquakes thousands of miles away. By comparing the times when the shocks are felt at different points, scientists can tell where an earthquake started.

Seismology, or earthquake science, is of great importance in engineering. The Panama Canal was built across the isthmus rather than across Nicaragua in part because the former site is somewhat freer from earthquakes than the latter. By studying the force and character of shocks, architects and engineers are able to construct buildings, dams, and locks in such a way as to withstand successfully shocks which might otherwise destroy them. Japanese experts say that nearly all the loss of life in the Messina earthquake might have been averted had the houses been constructed with due consideration for earthquake shocks.

SOME NOTABLE EARTHQUAKES

1755.	Lisbon, Portugal. A tidal wave swept over the city, 30,000 to 60,000 lives were lost, and the city was practically destroyed.
1811-12.	New Madrid, Mo. Reelfoot Lake in Tennessee and Kentucky formed by the sinking of a part of the flood plain of the Mississippi. Slight quakes are still occasionally felt in this region.
1886.	Charleston, S. C. Twenty-seven lives lost, 14,000 chimneys shaken down, and locomotives derailed. The shock was felt over a very great area.
1891.	Mino and Owari, Japan. Killed, 7,279; injured, 17,393; wholly destroyed, 197,530 houses. Sixty per cent of the Japanese Empire was affected.
1897.	Bengal and Assam, India. Thirty lakes produced by changes of level.
1906.	San Francisco, Calif. About 700 persons killed, 100,000 to 200,000 made homeless; loss to property of $200,000,000, chiefly by fire following the 'quake. A movement ranging up to 23 feet is recorded.
1908.	Sicily and Calabria, Italy. About 76,000 persons killed, 95,000 injured, and a great part of Messina and surrounding villages and towns destroyed.
1915.	Central Italy. About 30,000 lives lost and 372 towns and villages damaged.
1917.	Guatemala. About 2,500 lives lost in quake that lasted a week.
1919.	Porto Rico. 116 lives lost and over $3,000,000 worth of property destroyed.
1920.	Orizaba District, Mex. A score of villages and towns affected and about 3,000 lives lost.

EARTHWORM. The earthworm is nature's plowman, ceaselessly at work turning over and loosening the soil and making it more fertile. "The earth without worms," wrote the great English naturalist, Gilbert White of Selborne, England, "would soon become cold, hard-bound, and void of fermentation, and consequently sterile." Charles Darwin estimated that an acre of garden has on the average about 53,000 worms, through whose bodies some ten tons of soil pass every year.

Some South African and Australian species of earthworms reach five feet in length, though American species are rarely a foot long. The surface of the earthworm's body is provided with tiny bristles which aid in crawling and in burrowing. The body is divided by furrows into a number of rings; those in front are larger than those in the middle and those behind are flatter, so that one can easily tell the head-end and the tail-end.

The earthworm, although to general appearances so low in the scale of life, is wonderfully constructed, and is provided with organs of digestion, circulation, nervous life, etc. The digestive system is a muscular tube running through the body, having a crop and gizzard in its course; the front end of it is capable of being thrown out and drawn in by a set of muscles. The food consists of animal and vegetable matter mixed with the soil, for example, minute fragments of old leaves. Therefore the earthworm fills its alimentary tube with earth in which are scattered particles of animal and vegetable matter. The food is digested and absorbed into the system and the earth is voided again. In this way these worms work the soil over. They also bring vegetable mold to the surface, and bury objects thrown upon the ground, at the rate of two inches or more in ten years. There are about 90 species of earthworms in North America, mostly of the genus *Lumbricus*. (*See* Soil; Worms.)

Mr. Earthworm Tells His Own Story

YES, my name is Earthworm, but Mr. Fisherman and most other people call me just Angleworm. I like Mr. Scientist and the name he uses for me, for he takes a lot of interest in me and has written big books about me and my relatives.

"You ask me to tell all about myself in just a few words? I'll do my best, but there are so many things that are interesting and important that I can't tell nearly all of them.

"PLEASE, DON'T STEP ON ME!"

"I'm really a very good friend of the gardener. I work over his soil for him. So, if you will just leave my friend and myself alone, we will crawl back into the ground again and not bother you any more."

"I live in rich soil, and am constantly eating my way through it, for it contains many morsels that are good for me. But at night I come to the surface to get bits of dead leaves and grass to eat, and to leave my wastes. In this way all the earthworms together bring great quantities of earth to the surface. So we plow the ground, making it porous and doing work of much importance to the farmer. I am active only when the ground is damp. In dry summer weather I burrow down and roll myself into a ball, and in winter I go down below the frost line.

"When you met me on the walk the other day, during the rain, I was looking for a new place to live in. We get crowded in the old places; also, it seems that inbreeding is bad for us. And so we move from time to time, when the ground is wet and the crawling is good. Many people think we rain down. Ridiculous notion! They might as well think of people raining down!

"You can see at a glance that I am very different from you and your relatives in my makeup. I am composed of about 140 rings or segments. My mouth end is a bit larger and my tail end flatter. The swelling on my body is my 'saddle'. I have no legs to crawl with, and no eyes or ears or feelers—they would just be in the way as I crawl through the ground. But my sense of touch is very delicate, and I can tell the difference between light and darkness. If you will look at me closely, you will find four pairs of little pegs in each of my rings that help me in crawling, and many small holes on the surface of my body, which are the outside openings of my tiny kidneys and other organs on my insides.

"I am sure that you would find my insides the most interesting of all, for I'm not the mushy, formless thing most people think me. Of course, since I am without a skeleton, inside or out, I am very limber, and this is of great advantage in moving in my burrows. But I have all sorts of organs and systems that serve my purposes very well. I have a very excellent digestive system, with a gullet, crop, gizzard, and intestine; a tiny pair of kidneys in each of my rings, besides some other organs; and a splendid blood system for circulation, about as complete as your own, and red blood. Mr. Scientist says I have a very small 'brain' in my head, but that I can't think, at least not very much. Well, many of *you* don't think a great deal! But I don't suffer pain, and this saves me a lot of trouble when Mr. Fisherman puts me on his hook; and when I am cut in two—but then I can grow out again, if it is the hind part of me that is lost. Mr. Scientist also says I am made up of all sorts of cells and tissues, and he ought to know, for he has studied me a great deal.

"When I get ready to lay my eggs, I form a little case or *cocoon* around my saddle, and lay a dozen or so tiny microscopic eggs into it—every night or two. When my children hatch out, in a couple of weeks, they are just tiny mites, less than an eighth of an inch long. In a year or two they are grown up.

"Yes, my life is usually a happy one, for I lead the simple life, and my needs are few. But sometimes I have great scares, and many of us lose our lives, for enemies of monstrous size are always on the lookout for us—robins and other birds that nab us whenever we get our heads out of the ground; and moles that tunnel through the ground and devour us.

"You have asked me about my relatives also. There are other Earthworms, about first cousins of mine, and differing from me only slightly in size, color, and place of living. Mr. Scientist says I have many cousins of all kinds living in fresh water, and in many places in the sea, mostly with only hard scientific names. Some are very small; some are larger and said to be handsomer than I, with eyes and wonderful tentacles. And the Leeches are remote cousins of mine, though I don't like to confess it, for I am told they have the wicked habit of sucking the blood of turtles and other animals."

EAST AFRICA. "Let's go lion hunting!" No matter where this alluring proposal is made—London, New York, San Francisco, Hongkong, or Calcutta—if you follow it up you will be likely to find yourself eventually on the hot deck of a steamer in the Indian Ocean, bound for Mombasa, the old city first established by Arab and Portuguese traders which is today the gateway into that immense territory known as British East Africa. The steamer will come to anchor in a small harbor on the sweltering coast, and with the aid of the athletic Swahili natives, you will be transferred in due time to the famous Uganda railway. The next day when you wake up in your comfortable compartment, you will look out on broad rough plains and wooded mountains, and when you leave the train at Nairobi you will find yourself in an upland town of 14,000 inhabitants, the outfitting point of the greatest big-game country in the world.

A TRIBAL CEREMONY IN EAST AFRICA

These Kikuyu boys are celebrating their admission to manhood, according to the custom of the tribe, with a wild dance. Among the Kikuyus, boys and girls become "men" and "women" at early ages, and each year a great festival is held in honor of the year's "class" of grown-ups. After these ceremonies members of the "class" are free to marry.

But the lion, the rhinoceros, the leopard, and the giraffe are not the only romantic features of this land. In the wild regions at the end of the railway around and beyond Lake Victoria, the famous explorers of the last century struggled to blaze the trail for empires. In a close race for territory in 1884, Germany drove into the south the great wedge of her East African colony, shattering for a time the British dream of an "all-red" strip and railway from the Mediterranean to Cape Town. But 30 years later, the World War of 1914–18 was carried into the jungle. The British South African forces marching northward from Rhodesia, and the Belgians entering from the Congo in the west, met in the forests of Ujiji (ṳ-jē′jē), the victorious detachments pushing down from the Uganda railway and inland from Dar-es-Salaam, the former German port, and the great dream was realized.

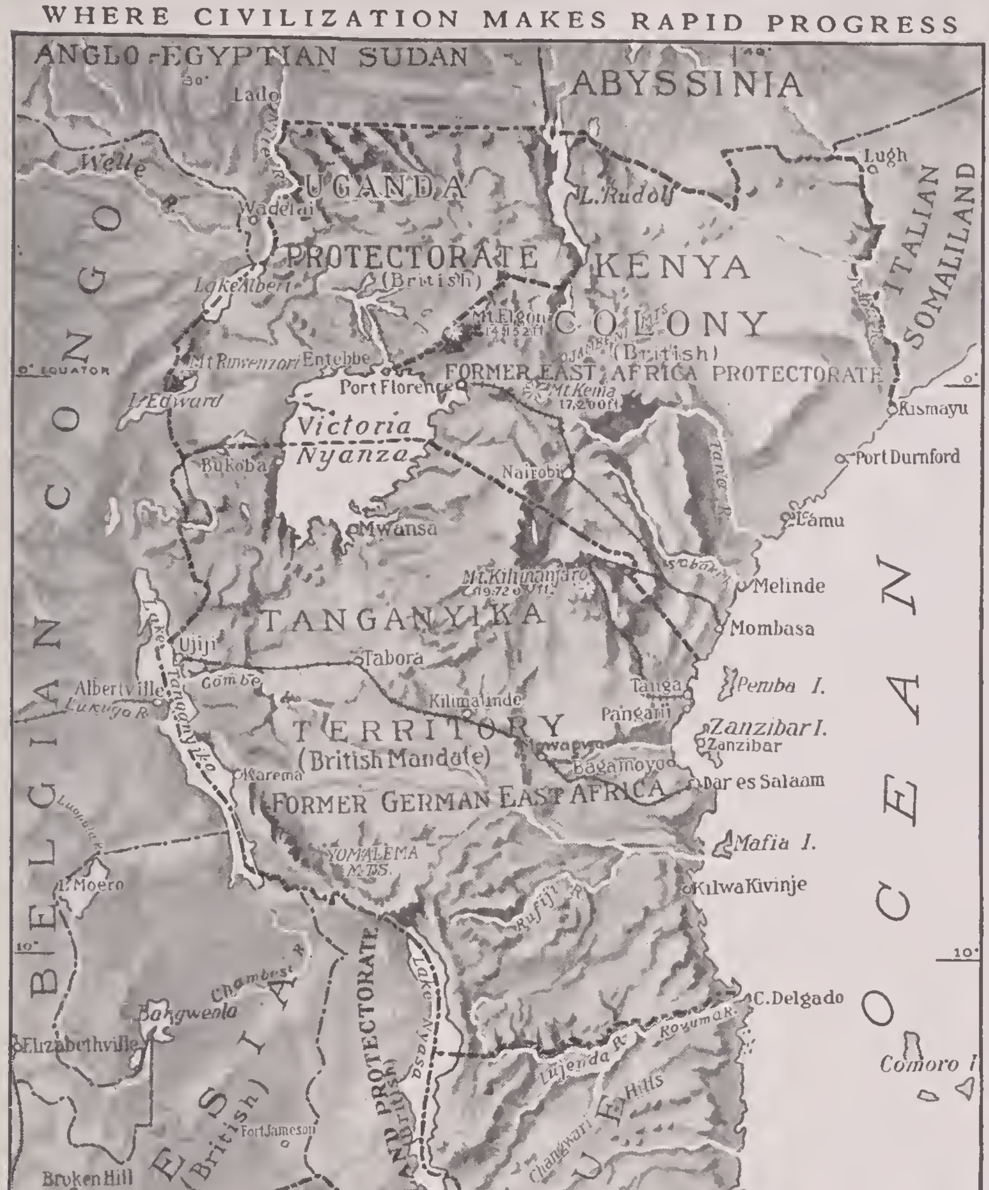
The broad term East Africa includes the British East Africa Protectorate, the Uganda Protectorate reaching northward to the Anglo-Egyptian Sudan, the former German province of East Africa, Portuguese East Africa (Mozambique), and the islands of Zanzibar and Pemba (*see* map).

The British East Africa Protectorate is bounded on the north by Abyssinia and by Italian Somaliland. From 1888 to 1895 it was administered by the British East Africa Company, but when the task proved too heavy the country was handed over to the crown, which now rules through a governor stationed at Nairobi. The Uganda railway, of which 618 miles were completed in 1919 at enormous expense, has done much to encourage agriculture, but cattle-raising here is made difficult by the deadly activity of the tsetse fly (*see* Tsetse Fly). The coast population, consisting of a mixture of negroes, Arabs, and Hindus, carries on a small but active trade in ivory, skins, and ostrich feathers, with the tribes of the interior. In the hope of increasing the number of white settlers, Great Britain has issued many grants of land. This land is fertile wherever water can be found. Rice is grown along the coast, and timber is an important export.

The Uganda Protectorate is still partly governed by native chiefs and kings under British supervision. The leading tribes are the highly intelligent Baganda, who have been converted to Christianity by British and French missionaries. The Uganda railway extends from the coast to the waters of Lake Victoria, and Lake Albert, Lake Albert Edward, and Lake Rudolf which provide extensive means of transportation. Uganda includes the course of the Nile from Lake Victoria to Nimule, where the Anglo-Egyptian Sudan begins (*see* Victoria Nyanza). Part of its western boundary is formed by the Belgium Congo.

Uganda is not as rich in big game as the Eastern Protectorate, and the natives live largely on bananas. The chief economic resources are cotton, coffee, rub-

WHERE CIVILIZATION MAKES RAPID PROGRESS



The vast region shown on this map is the scene of a thrilling struggle between the forces of civilization and the forces of savagery, in which civilization is rapidly getting the upper hand. Under British control, East Africa is slowly being turned into farmland. The lion and the leopard are giving away to the plow and herds of domestic cattle. You can see here how Great Britain's dream of possessing a solid strip of territory from the Union of South Africa to Egypt was realized by the annexation of the former German colony, following the World War.

ber, and ivory. Extensive experiments in agriculture are being conducted from the British headquarters at Entebbe on the northwest shore of Lake Victoria.

The former German colony of East Africa occupied 620 miles of coast line between British East Africa and the Portuguese colony of Mozambique, extending inland to Lake Tanganyika and the Belgian Congo. After acquiring the colony in 1884, the Germans exploited the land to its uttermost, establishing a serf system to compel the negroes to work on the rubber, cacao, tea, cotton, and other plantations, from which the colony drew its wealth. In 1905, however, as the result of a series of revolts put down with much bloodshed, they decreed that all children born after that date should be free from bondage.

The high pasture lands of the interior feed great numbers of cattle and sheep, mostly owned by the natives. Coal, iron, lead, and copper exist in abundance, still awaiting the white man's development. The German-built railroad from Dar-es-Salaam, the principal seaport, to Ujiji is 780 miles long, while that from Tanga to the foot of the Kilimanjaro, the highest mountain in Africa, is 220 miles.

After more than three years of fighting against the native troops trained and commanded by German officers, the British and Belgian forces conquered the entire colony early in 1918. All except a small district in the northwest (which went to the Belgian Congo) was then assigned to Great Britain under a mandate from the League of Nations, and was rechristened the Territory of Tanganyika.

Portuguese East Africa, or Mozambique, lies to the south of the former German colony, and fronts the French island of Madagascar across the 300 miles, breadth of Mozambique channel. The beginning of the Portuguese occupation dates back to the voyage of Vasco da Gama, in 1498. Today the colony has an area of 428,132 square miles—more than 12 times the size of the mother country. The Zambezi, Shire, and Limpopo are the chief rivers. The country possesses great mineral as well as agricultural possibilities—coal, iron, gold, etc.—but the unfavorable climate and lack of enterprise and resources on the part of the government have retarded development. Lourenço Marquez, the capital, is on Delagoa Bay, a highly important harbor, which has been regarded as "the key to South Africa," and which is much coveted by the British. It is connected by rail with Pretoria, the Transvaal capital, and is the chief outlet for that rich mining region.

Population of East Africa Protectorate, 2,800,000; of Uganda Protectorate, 3,300,000; of former German East Africa, 7,700,000; of Portuguese East Africa, about 3,120,000.

EASTER. "The Sunday of joy"—Easter—when churches are sweet with white lilies and echoing with music, and hearts are throbbing with new hope, is the celebration of the Resurrection of Jesus the Christ. The 40 days of Lent, a time of self-denial and penitence, are over; Good Friday, with its sad memories of the crucifixion, is past; and the thrill of the age-old message, "The Lord is risen," fills every heart with gladness. The Easter service is the most elaborate of the church year. Special music is one of the most important features. Some of the finest of all sacred music is that written for use in the Easter and Passion Week services.

The name Easter comes from that of the ancient Anglo-Saxon goddess of spring, *Eastre*, in whose honor a festival of spring was held in the month of April. It is from these old-time pagan festivals that many of our Easter customs have come. Easter also contains survivals of the Passover feast of the Jews, observed in memory of the coming out of Egypt.

One of the oldest of Easter customs is exchanging colored eggs as symbols of the resurrection. From time immemorial eggs have been used to represent the new birth of the springtide. An old legend relates that colored eggs are the gift of the rabbit on Easter Eve. The decorated cards that are often sent as Easter greetings frequently contain "bunny's" picture, along with white Easter lilies and colored eggs.

Easter has been celebrated as a church festival since very early days of the Christian church. It is known as a movable feast because it is not always held on the same date. The church council at Nicaea, in Asia Minor (325 A.D.), decided that Easter should be celebrated the first Sunday after the first full moon after the vernal equinox (March 21). But the calculation of the date is very complicated, and most of us are content to take it from those who make the calendar.

Easter is the climax of a series of special days of observance instituted by the early church. Lent is the fast of 40 days which ends with Easter. The first day of Lent is Ash Wednesday, from an ancient custom of strewing ashes over the head as a sign of penitence. Palm Sunday is one week before Easter and commemorates the triumphant entry of Jesus into Jerusalem. On this day churches are still decorated with palm branches. The Monday following opens Holy Week, or Passion Week, in which are observed Holy Thursday, commemorating the last supper of Christ with the disciples; Good Friday, commemorating the crucifixion; and Holy Saturday, on which in the Catholic church the first Easter mass is held, and which closes Lent.

Shrove Tuesday is the day preceding the beginning of Lent. In certain Catholic countries of Europe for centuries this day and those immediately preceding have been kept as days of carnival, with masquerades, processions, battles of flowers and confetti, and similar gaieties. In the United States the Mardi Gras ("fat Tuesday") of New Orleans is a similar festival.

EASTER ISLAND. In the South Pacific Ocean, 2,000 miles from the cost of Chile, lies one of the world's most fascinating mysteries. It is the little speck of land known as Easter Island. Today it supports scarcely more than 100 Polynesian natives; and yet upon it are stone ruins which tell of a bygone civilization, the origin and fate of which are utterly unknown. Chief among the ruins are great stone platforms upon which lie the remains of gigantic statues. In nearby quarries huge half-cut figures stand, just as they were when the mysterious workmen laid down their tools on some fateful day of long ago.

The heads of the big gray images were cut flat to receive crowns made of reddish stone. A number of these crowns have been found in the quarries and near the platforms. The ruins also include remains of large stone houses which command magnificent views of the sea. While other islands of the Pacific have somewhat similar remains of ancient builders, the ruins of Easter Island alone bear traces of picture-writing. The meanings of these "pictographs," scientists have tried in vain to unravel. (*See* Pacific Ocean).

Easter Island is roughly triangular in shape with a volcanic peak at each corner. Its total area is 45 square miles. While it was probably sighted by earlier navigators, its actual discovery is credited to the Dutch Admiral Roggeveen in 1722. It has belonged to Chile since 1888.

EAST INDIES. Stretching eastward for nearly 4,000 miles from the southeast coast of Asia, on past the northern coast of Australia, lies the largest group of islands in the world, known variously as the Malay Archipelago, the Indian Archipelago, and the East Indies. It includes the Sunda Islands, the Moluccas, New Guinea, and the Philippines. Among the larger islands are Sumatra, which is nearly three times the length of Florida; New Guinea, which is larger than Great Britain; Borneo, in which, as one author says, "the whole of the British Isles might be set down and would be surrounded by a sea of forests"; Celebes, larger than Ireland and Scotland combined; and Java, and Luzon, each about the size of Ireland. Besides these, there are hundreds of smaller islands, many of them of great beauty and fertility.

A deep strait separates the islands of Bali and Lombok, just east of Java—called "Wallace's line," from

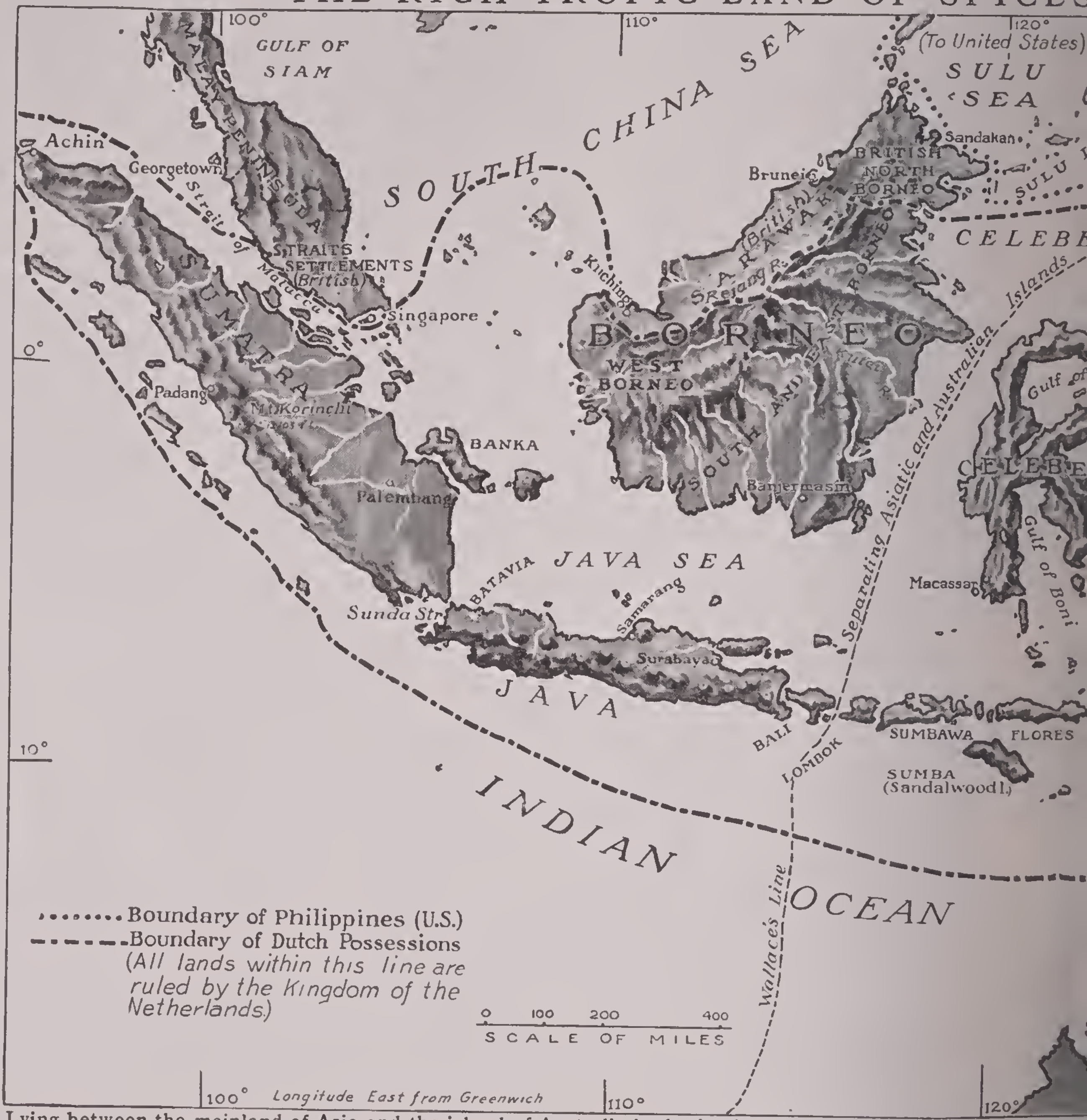
THE FLOWER THAT BLOOMS AT EASTER-TIDE

Could a more fitting symbol of the Easter spirit be found than this noble flower—the Easter Lily? Its tall slender green stalk is the symbol of the reawakening of Spring, and those crowning blossoms, pure white, crisp, and perfect in their grace, seem to bear a message of solemn joy.

the naturalist, Alfred Russel Wallace—and this was supposed to form part of the dividing line between the Australian lands and those of Asia. Geographically Bali belongs to Asia and Lombok to Australia; this fact was said to be evident in the vegetation, animal life, and even human life on the two islands. Though the strait is only 20 miles wide, the difference is as great as that between Africa and South America. Today a better line of demarcation is supposed to lie east of Timor and Celebes.

One of the most remarkable features of the archipelago is the large number of active and extinct volcanoes—some of them more than 1,200 feet in height—which commence in Sumatra, extend southeast through the larger Sunda Islands, and are then deflected northward through the Philippines, forming a rough horseshoe. The Equator passes through the center of the archipelago.

THE RICH TROPIC LAND OF SPICES



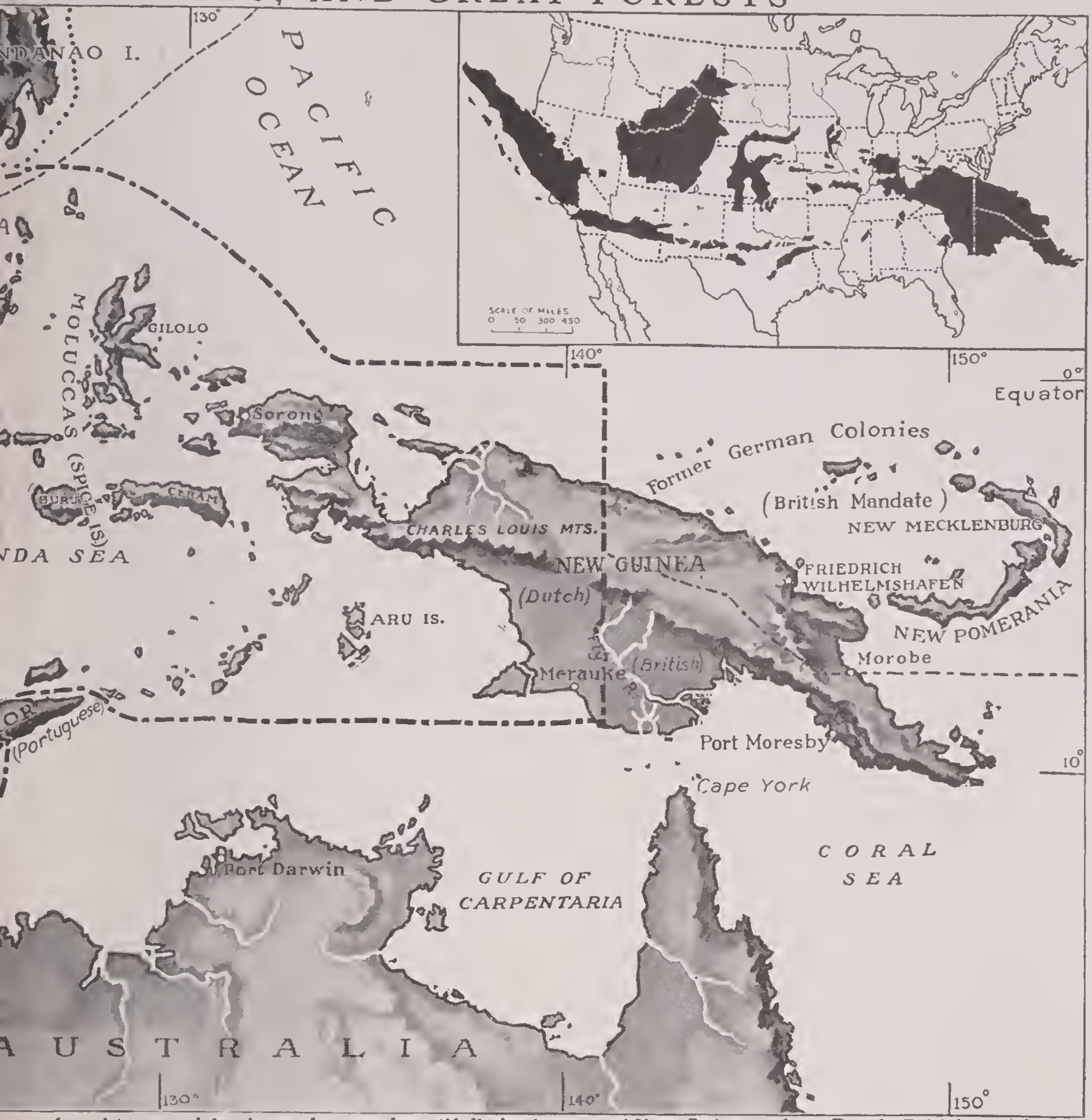
Lying between the mainland of Asia and the island of Australia is the fascinating group of islands known variously as the Malay Archipelago, the East Indian Archipelago, and the East Indies. The whole group shows Nature in her most luxuriant mood, with tangled forests, richly colored birds and flowers, and, to crown it all, a mighty array of steaming active volcanoes. In olden days the Orient drew from these islands a rich supply of spices for trade with Europe. But since the early 16th century Europeans have conducted the trade direct. After many struggles, the islands were divided among the chief contestants, with the lion's share going to the Dutch, as you can see by looking at the map. The curious divisions which resulted when the arbitrary lines

The East Indies are the rich "spice islands" sought by Columbus, Vasco da Gama, and other explorers. Many tales had reached the European countries of these wondrous islands whence came "the spices of Araby," and of the lucrative trade carried on by the Malays, Chinese, and Arabs, and their dream was to share in these riches. Early in the 16th century Portuguese adventurers, braving the dangers of the pirate-infested seas, finally reached the island of Sumatra. Soon after that other nations made their way to the islands, and wars for their riches were waged by England, Portugal, and Holland.

Today the greater part of the group belongs to the Dutch. North Borneo, however, is British, as is also a part of New Guinea. Under the name of Kaiser Wilhelm Land, the northeastern third of New Guinea was, before the World War, held by Germany; the Versailles Peace treaty assigned it under a mandate to the British Commonwealth of Australia. The Philippines have belonged to the United States since 1898. The majority of the native inhabitants are of two races, the Malays and Melanesians (Papuans). The chief exports are sugar, spices, tobacco, various gums, coffee, tea, petroleum, etc.

Several East India joint-stock companies were founded in European countries, early in the 17th century, to advance the commercial and political interests of those nations. The most important was the English East India Company, chartered by Queen Elizabeth in 1600. From this grew in time the great Indian Empire of Great Britain (*see* India). The Dutch East India Company, incorporated in Holland in 1602, was the starting point for the rich Dutch colonies (*see* Netherlands, Kingdom of). A French East India

VOLCANOES, AND GREAT FORESTS



were found to cross islands can be seen beautifully in the case of New Guinea, where Dutch, British, and former German possessions meet at a point. Another curious feature of the group is the so-called "Wallace's Line," named after Alfred Russel Wallace, the great naturalist who traced it. Although the islands on each side of this line are so close that animal and plant life ought to be the same on both sides, there is really a sharp division, the life west of the line being Asiatic, and the life to the east being of the peculiar Australian type. The inset diagram in the upper right-hand corner shows how this group of islands, stretching nearly 4,000 miles from the western tip of Sumatra to the eastern tip of New Guinea, would look if dropped across the United States.

Company was chartered in 1664, but failed to secure adequate support from King Louis XIV, who was more interested in his European wars. In the 18th century a Danish East India Company throve for a time, but was ruined in the Napoleonic wars, when Denmark took the side of the French against the English.

EBONY. The saying "black as ebony" gives the clue to the chief characteristic of this valuable cabinet wood—namely, its jet black color. This, combined with durability, hardness, and the readiness with which it will take a high polish, makes it highly prized for ornamental cabinet work and for inlaying. The black keys of pianos are made of ebony, and it is frequently used for knife handles and for similar small articles.

Of the numerous tropical trees which produce this hard black timber, the most important is the ebony tree of southern India and Ceylon, which yields logs of ebony up to three feet in diameter. Only the heartwood is used, for the sapwood underneath the bark is perfectly white. Trees of western Africa and the East Indies also produce a fine ebony. The West India ebony is a small tree or shrub, rarely more than four inches in diameter, which produces a rich dark brown wood.

Most ebony trees belong to the genus *Diospyros*. Scientific name of the southern Indian variety, *Diospyros ebenum;* it is distinguished from other species by its jet black charred-looking bark.

ECHO. Nearly all ancient peoples had pretty poetic stories about the echo. According to the old Greeks, Echo was a mountain nymph who had pined away for love of the youth Narcissus, until there was nothing left of her but her whispering voice; and this she could only use to repeat the last word of others. When you called out in mountain glens, "Hello!" Echo answered softly, "Hello!" And when you cried "Who are you?" you heard only her mocking answer, "You!"

No one really knew what an echo was until wise men discovered that sound travels in waves, just as water and light travel. If a wave of water is stopped by a cliff it is thrown back into the sea. So if a sound wave is stopped by a cliff or a wall, it is thrown back to our ears. The sound very seldom comes back just as it was made. It is usually broken into an airy shattered echo, just as a wave is thrown back in spray; and it really seems as if some mocking sprite calls back from a fairy grotto in the rocks. Sometimes the echo repeats the sound several times. This is caused by successive rebounds from several different objects, placed at varying distances from the observer. If you stand about a hundred feet from the reflecting surface, you hear only the final syllable of

AND ECHO ANSWERS "YOU"

The Greeks had a myth that echoes were the voice of a nymph who had pined away from hopeless love until only her voice remained. She was supposed to haunt the woods and rocks and repeat the last syllable of any cry she heard. Above is the head of a beautiful statue by the sculptor Herzig, representing Echo listening for a call.

what you call. If you take your stand farther back, more and more syllables can be heard.

Sir Isaac Newton used the echo in a corridor at Trinity College, Cambridge, to measure the speed at which sound travels. Standing at one end of the corridor he started a group of sound waves by stamping his foot. These waves were thrown back by the wall at the far end of the corridor. By timing the interval between stamping his foot and hearing the echo, he learned how long it took the sound to travel down the corridor and back. He thus found that sound travels at the rate of 1,089 feet a second. (*See* Sound.)

ECLIPSE. The primitive Northmen thought the sun and moon were pursued by two enormous wolves, who now and then very nearly succeeded in devouring our chief sources of light. Even till recent days the Chinese believed a solar eclipse was caused by a great dragon attempting to swallow the sun. On such occasions they would go out into the streets and set up a terrific din to frighten the monster away.

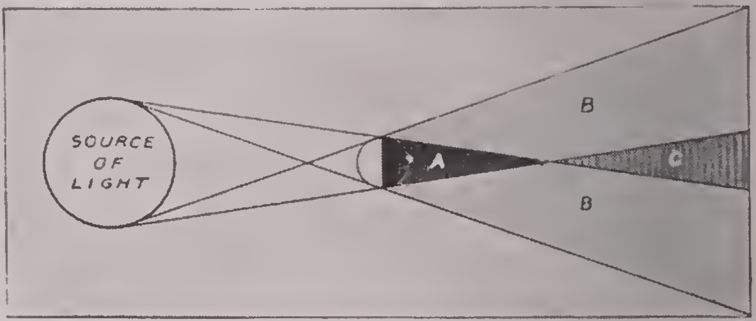
The facts are not so romantic, though it would be near the truth to say the sun and moon and earth are playing hide and seek with one another. A solar eclipse occurs when the moon gets between the sun and earth, obscuring the sun from our view. A lunar eclipse, on the other hand, is caused by the shadow which the earth casts on the moon when the earth is between the moon and the sun.

Imagine a straight line drawn through the sun and earth and extending beyond the earth on the other side. If the moon in its monthly trip around our planet always passed directly through this line, first on one side of the earth and then on the other, we should see two eclipses every month—one of the sun and one of the moon. But the moon moves in an orbit which is tilted somewhat away from the orbit made by the earth in its annual journey around the sun, and for that reason eclipses are comparatively rare. There may be as many as four of the sun and two of the moon in a year, or there may be no eclipses of the moon and only two of the sun. In many cases, of course, these eclipses are only partial, and from a single spot on the earth it is not likely that a total solar eclipse will be observed more than once in 300 years. An "annular" eclipse is one in which a considerable rim of the sun is still visible around the edge of the moon; it occurs when the moon is farthest from the earth.

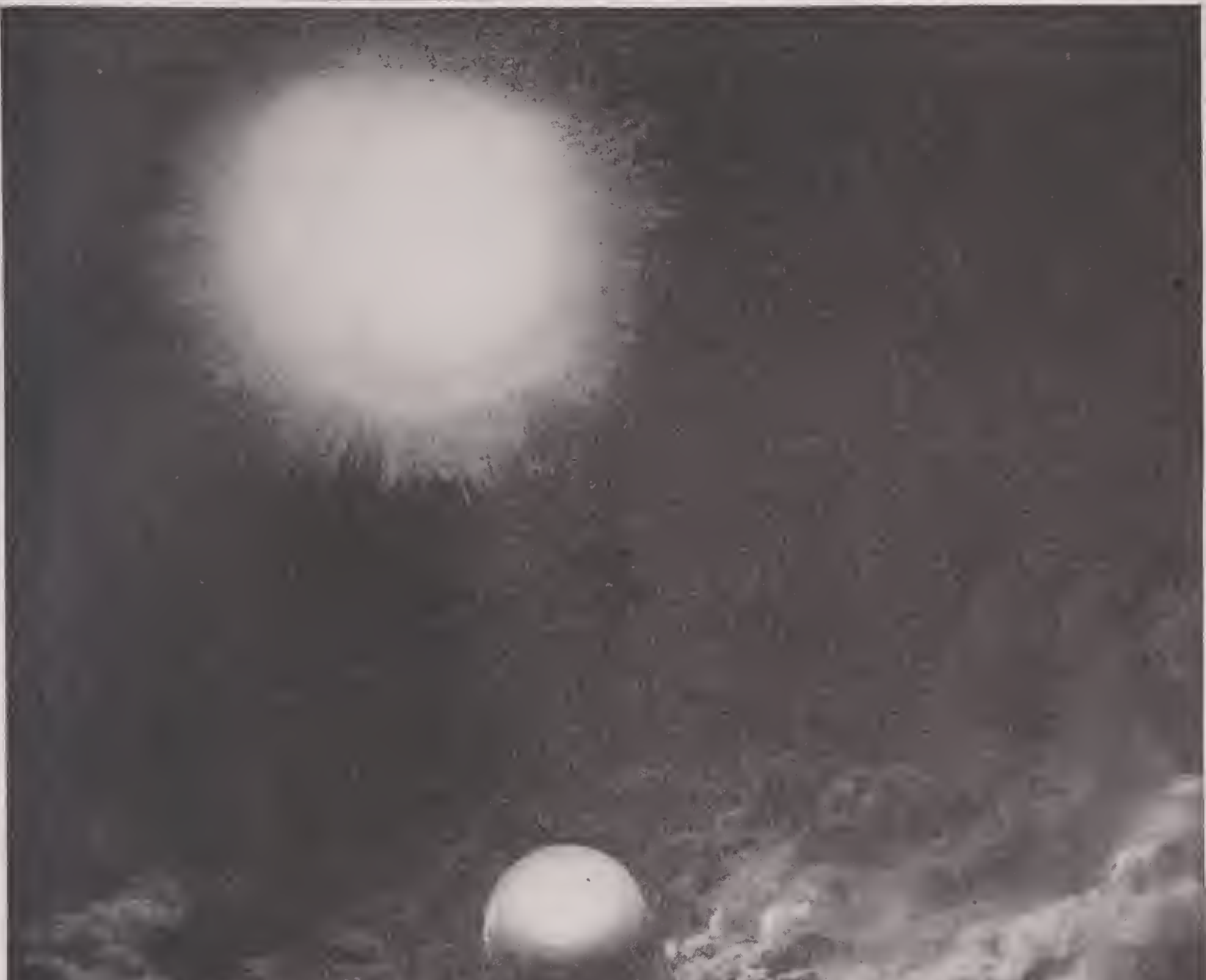
It is little wonder that primitive people were frightened by a solar eclipse. For a period of seven minutes or less the earth is plunged in darkness, the stars flash out, flowers close up, birds go to rest, and cattle in the field become restless and terrified. Around the edges of the moon can be seen numerous rose-colored prominences, while shooting still higher—200,000 miles or more from the surface of the sun—are streamers of pearly light which constitute the *corona*. This can only be observed at the time of an eclipse. A solar eclipse is always the occasion of numerous expeditions of scientific men who travel long distances to find a favorable place for observation.

The scribes of ancient days often noted down the occurrence of eclipses. Sometimes the sudden hiding of sun or moon altered the course of history by arousing the superstitious fears of the people. By means of mathematical computation, astronomers can now determine exactly when these events must have taken place. One celebrated example is mentioned by Herodotus, when the Medes and Lydians, after fighting for five years, laid down their arms and made peace because of the occurrence of a solar eclipse just as they were about to go into battle. This date has been fixed as May 28, 585 B.C. Other planets beside the earth eclipse their satellites, and certain stars are sometimes darkened by companion bodies, but these phenomena are usually called "occultations."

THE SHADOWS OF AN ECLIPSE



The black space lettered "A" is the region of total eclipse called the "umbra." The space marked "B" is the "penumbra," or region of partial eclipse, from which a crescent-shaped portion of the sun is seen. In the space "C" the sun is seen as a ring, with a dark spot made by the moon in the center.



If you were floating in space some thousands of miles away from the Earth, this is the way an eclipse would appear to you. The Moon, you see, has come in line with the Sun, and casts down its conical shadow. Complete darkness comes in only one comparatively small circle—in this case in the middle of the Sahara Desert in northern Africa. But partial darkness extends over a much larger area, where only part of the sun can be seen.

ECOL'OGY. We always find hepaticas in the woodland, daisies in the meadow, water-lilies in the pond, the muskrat in the creek, and the kingfisher darting over the stream. When we study the reasons why this is so, we are really getting our first lessons in "ecology" which is the branch of botany and zoölogy that deals with the relations of living organisms to their surroundings.

The reason for such relations as those mentioned is found in the form or habits of the plant or animal, that enable it to live and thrive in a certain environment. The muskrat has waterproof fur, and feet fitted for swimming, which enable it to live in the water where it finds its food and builds its winter house. The kingfisher has a long beak for seizing a fish and can dive into the water with safety for its prey. The water-lily has leaves and flowers that float, a root that anchors, and stems that are pliable to hold the leaf and blossom-boats fast to the root anchor; thus this plant is fitted to live in still waters. The daisy is fitted by root and leaf to live in the meadows in the bright sunshine. The hepatica develops its leaves early, so that they make plenty of food for it to store up before the trees above it spread a deep shade, and thus they are fitted for life in the woodland.

The science of the adaptations which enable the animal or plant to live in certain places is called "physiological ecology." If we go out in the meadow to study the daisies or into the woodland to study the hepaticas, we find that there are many other plants living in each of these places and that they too are adapted to these situations.

So all the plants that we find living together in one environment we call a "plant society." Those growing in the woods we call a forest society; those in the meadow, a meadow society; those in the swamp, a swamp society, etc. This grouping of plants and the reasons for it are called "physiographic ecology."

If we should travel to the arctic regions or climb high mountains, we should find there plant societies adapted to the cold and quite different from the plant societies found in warmer climates. And if we should visit the tropics we should find plant societies which could not live in the temperate or arctic climates. The science of the adaptations which fit plant societies to live under different climatic conditions is termed "geographic ecology."

The MISNAMED "*DISMAL SCIENCE*"

THE science of economics has been called "the Dismal Science" and "the driest of all subjects," yet it is one which closely concerns the material happiness of all mankind. Men by thousands have fought and killed one another over it. The French Revolution and the Russian Revolution began with differences of opinion about economic principles; and everyone knows that "taxation without representation" was the chief cause of the American revolt from England. There has been scarcely a war of modern times which did not arise, in part at least, from economic causes; while the structure of the world's life in time of peace centers more and more around the great science, on which is founded alike the prosperity of nations and of individuals.

ECONOMICS. Political economy or "economics," as the subject is now usually called, undertakes to study the rules which govern the production, distribution, and use of the valuable things of the earth. It deals with such subjects as capital and labor, wages, rent, interest, costs and prices, taxes, tariffs, international trade, and all other general aspects of industry, commerce, and finance. Here we can only outline briefly the principles which are necessary to an understanding of such economic problems as are likely to be met with in ordinary life.

We all need food, clothing, and shelter, and the simplest way of getting these things would be for each of us to grow our own food, weave our own clothes, and build our own houses. Such, indeed, is largely the custom of barbarian peoples to this day. But the standard of living among civilized peoples calls for more than bare food, clothing, and shelter. We demand delicacies and fine raiment, comfortable beds and houses, electric lights, telephones, automobiles, battleships, well-paved streets, churches, theaters, books, railways, and countless other things which we cannot each produce for himself. We have machinery which does the work of many men, but which no one person could afford to own for his private use alone. We have water plants and street-car lines whose value depends upon the fact that they serve the needs of a great many people at once.

In a word, we have arrived at what is called "division of labor," a state of society in which each person confines himself to doing certain things and exchanging his labor or its products for goods produced by others. The shoemaker makes shoes, the baker bakes bread, and each gets the other things he needs by barter or by selling his goods for money and then buying what he needs (*see* Money). Sometimes the "division of labor" goes so far that a person spends all his working time at one small operation, repeated over and over again, at which he becomes wonderfully expert.

We may divide the history of any commodity into three parts: production, consumption, and distribution. The mining of iron ore, the manufacture of machinery, the growing and harvesting of grain, the grinding of the flour, the making of bread—these are all obvious examples of "production." But the railway and the grocery store are also engaged in production in the economic sense, for although they do not grow or manufacture anything, they actually "produce" a part of the value by placing the commodity before you where it can satisfy your desires. The final "consumption" comes, of course, when (let us say) you eat the bread; but there are also earlier stages, as when the grain was consumed in making flour, and when the flour was consumed in making bread. These stages are called "productive" consumption.

The most difficult and complicated of the three divisions is the "distribution" of the wealth created by production. Wealth here does not mean "riches"; it is defined as "anything which has the power to satisfy our wants and which cannot be obtained without effort." In the sense in which economists use the term, a handful of grain, a pound of flour, a loaf of bread are objects of wealth, and in this case the amount of wealth that has been created all along the line is measured by the ten cents you pay for your loaf.

That ten cents is indirectly divided up among all the people who had anything to do with producing the bread and placing it in your hand—from the miner, who dug the iron ore out of the ground, to the man who wraps up the loaf and delivers it at your door. It even pays the people who made the wrapping paper and the string, and it helps to pay the engineers, conductors, and brakemen of the trains that hauled the grain, as well as rents and taxes. In scores of ways it is divided up, until it is impossible to find an end to the tangle.

Of course, the actual ten cents you take out of your pocket doesn't do all of these things. The payments are made along each step of the way and are successively added on until finally they are summed up in the retail price of bread.

Land, Labor, and Capital

Let us ask ourselves what types of agencies take part in the production of wealth, as represented in this case by the loaf of bread. The answer of economics is land, labor, capital, and enterprise or management. The root of all wealth is in *land*. It is the source of all the raw materials of production. It yields the iron ore and the wheat crop; it provides the site for the mill and the factory. The share which land receives from the production of wealth may generally be measured in terms of "rent." Even if the farmer owns his own land, we must think of him as paying the rent to himself. For, if he let someone else work his farm, he would receive the amount of that rent without doing any work or taking any risks. So that, if he chooses to cultivate his own land, he denies himself this assured income, and must therefore repay himself for that loss before he can count the profits of his undertaking. The same principles apply to the land and even the buildings used for factory or store. And the amount of the rent in every case must be thought of as determined by the advantages of that land in competition with other land in the same market.

The next great agency in wealth production is *labor*. Without labor, wealth cannot be created out of natural resources. But we must not think of it as manual labor alone, for the superintendent and the foremen are as truly laborers in the economic sense as the men who actually plow the field and load the flour into the railway car. In either case the laborer's share of wealth is measured in "wages," even though the higher sounding name "salary" may be used.

The third element, *capital*, may be defined as "the results of past labor or enterprise accumulated by thrift." When a person acquires a share of wealth, he may either use it in satisfying his immediate wants, or he may deny himself this satisfaction and save it. In the latter case, that share of wealth becomes capital, which may be used to increase future production. Capital includes tools, machinery, buildings, raw materials; and it advances wages and all other expenses in the period—sometimes many months in length—between the beginning of production and the receipt of pay for the finished product. Money is merely one form of capital, and that not the most important. Capital's share from the production of wealth is called "interest"; in other words, interest is the price that men pay for the use of capital.

Enterprise or *management*, the fourth and last agency in the production of wealth, is the one which unites all the others and puts them to work, so to speak. We might have land, we might have men ready to labor, we might have capital ready to be used—yet nothing would be produced unless they were brought together in some definite undertaking. This task is performed by the man of enterprise—the *entrepreneur*, as old French economists called him. He is the one who conceives the productive project, who obtains the land, hires the labor, procures the capital, and who takes the risks. His share in the production of wealth is called "profits," and consists of whatever may be left over from the sales of the product after rent, wages, and interest have been paid. If the project has been a good one, the profits may be large; but if misfortune attends it the *entrepreneur* may get nothing for his pains.

The same person may, of course, be at the same time the landowner, the laborer, the capitalist, and the *entrepreneur*. This would be true of the small farmer who tilled his own field with a plow bought with his own savings. But in modern business such concentration of the wealth-creating agencies is comparatively rare.

Why Prices Rise and Fall

We are told that "the law of supply and demand" governs prices. In a general way this means that the price of a given commodity or service tends to rise when the demand for it exceeds the supply, and that the price tends to fall when the supply exceeds the demand. As prices rise, more and more persons will be induced to produce that commodity, while fewer and fewer people will be inclined to buy it, and vice versa. Supply and demand, however, seldom operate freely, and ordinarily many other factors enter into the determination of prices.

The bitterest social controversies are caused by questions dealing with the proper distribution of wealth and the ownership of such wealth-producing agencies as land and capital. Are wages to be determined by consideration of what will barely enable the worker to keep soul and body together, or shall they be fixed by collective bargaining between an organized trade union and the employers? Should the wage system be abolished altogether and coöperative production take its place; or should the state own all the means of production and all people work for the government—which would be a form of socialism? Should a few men be allowed to control the land and make others pay for its use, or should the Single Tax (*see* Taxation) be applied and the rent thus taken over by the state? Should the *entrepreneur* be permitted to acquire unlimited profits, or should his earnings be restricted by law, and monopolies prohibited? Should tariffs be levied for revenue only, or for purposes of protection and national policy? These are a few of the more important economic problems which agitate modern societies.

In spite of the apparent conflict of interest between classes and between nations, students of economics have come to recognize that the true economic welfare of all peoples are bound up closely together; that no class can build up a sound prosperity at the expense of another class; that no nation can thrive for long on a policy which impoverishes its neighbors.

One of the earliest groups of political economists was that of the "Mercantilists" (16th and 17th centuries) who leaned to the view that gold and silver were the chief forms of wealth. The "Physiocrats" of the 18th century held agriculture to be the chief source of a nation's wealth, and denounced the restrictive measures by which their predecessors encouraged manufactures and commerce. 'The Wealth of Nations', published in Great Britain by Adam Smith in 1776, laid the foundations of the more modern science and gained for its author the name "the father of political economy." T. R. Malthus' writings on the laws of population, and David Ricardo's on the "iron law of wages" both advanced the classic school of the science. John Stuart Mill's 'Principles of Political Economy' (1848) long remained the standard treatise from this point of view. Since that time a host of British, French, German, Austrian, Italian, and American writers have dealt with the subject from less abstract and more historical points of view, and profoundly modified and humanized the teachings of this once "dismal" science.

A LAND *of* VOLCANOES *and* PANAMA HATS

The "Equator" Country, where Planting and Harvesting Go on Side by Side, where the Mountain Peaks are so High the Snow Scorns the Burning Sun, and Where Cotopaxi Spouts its Wreaths of Smoke

ECUADOR (*ĕk'wȧ-dôr*). One of the smallest of the South American republics, Ecuador has some striking points of difference from its neighbors, for the narrow arid coast line characteristic of northern Chile and Peru here gives way to a broad seaboard clad in tropical verdure. This arises from the fact that the Antarctic current, whose cold waters prevent the evaporation of the sea water to form rain, is suddenly turned westward by the bulging coast of Peru. The coast of Ecuador therefore enjoys the abundant rains of most tropical countries, and its broad plains are covered with dense forests and tillable soil which will some day be a source of great wealth. Ecuador is further unique in that it has the only considerable group of navigable waterways, and the only important gulf—the Gulf of Guayaquil—on the whole Pacific coast of South and Central America.

A 300-mile railroad journey to the northeast of the city of Guayaquil (the republic's only seaport, population 105,000), ascending the steep slopes of the Andes to a height of 9,343 feet, brings the traveler to the capital Quito, one of the strangest cities in the world. Although Quito (population 70,000) is within 15 miles of the Equator, its great height gives it a climate of perpetual spring. One season is so like another that planting and harvesting go on side by side. Above the city tower great mountain peaks which, though in the heart of the tropics, never lose their mantle of snow. Ecuador, which is the Spanish word for Equator, is the only equatorial region in the world permanently habitable for white men.

The mountain pass which gives entrance to the fertile plain of Quito is guarded by the most stupendous group of snow-clad peaks to be seen in the whole world. Twenty-two towering summits, several of them volcanoes, face each other in symmetrical array. Here stands the majestic Chimborazo, long supposed to be the highest peak of the Andes. Nearby is Cotopaxi the unrivaled, the loftiest active volcano in the world, whose summit is ever shrouded in wreaths of smoke and clouds.

The Mysterious Incas and Their High Civilization

Hundreds of years before the Spanish conqueror set foot on the continent, Ecuador was inhabited by a race of unknown antiquity—a semi-civilized people who built roads, palaces, and temples of stone, wrought household implements of pure gold, filled teeth with gold as skilfully as any modern dentist, and who have left mysterious memorials of their art in groups of great carved stone chairs, beautifully designed and ornamented. Long before the Incas founded their empire this prehistoric race built its cities and temples on the heights of Ecuador, and then vanished, no one knows how or when (*see* Incas.)

Ecuador has two more peculiar claims on our interest. It was here, apparently, that the Spanish conquerors were first introduced to the potato, which is a native of this part of the world; and Ecuador today furnishes nearly all the world's supply of Panama hats.

Ecuador's climates—for it has several varieties—are arranged in vertical belts. Above the tropical lowlands, the abode of perpetual summer, lie the plateaus enclosed between the eastern and western ranges of the Andes, where it is always spring; and higher still, unbroken winter makes life almost impossible. On the eastern slopes of the Andes and in the valleys of the Amazon River system are tropical forests and swamps, where the oppressive heat and humidity are dangerous to any but the Indian natives.

Ecuador also possesses the Galápagos Islands, lying on the Equator 730 miles to the west, embracing a territory of about 2,400 square miles. They have strategic importance, since they lie directly in the path of vessels approaching the Panama Canal from Australia, but their chief interest arises from the study made of their natural history by Charles Darwin, the great English scientist. They are the home of a giant tortoise that can carry several men on its back.

THE GATEWAY TO ECUADOR

Guayaquil is the chief port of entry to the "land of the Equator." Until recent years, because of its heat and insanitary conditions it had the reputation of being one of the unhealthiest cities of the world. In addition to yellow fever and other pestilences, it had a disease all its own—"Guayaquil fever." Modern improvements and a fire which wiped out a large number of unhealthy dwellings have helped to improve conditions.

In the fertile lowlands of the coast is grown about one-fifth of the world's cocoa beans. Here too grow cotton, vegetable ivory (or "tagua" nuts), fiber for Panama hats, coffee, sugar cane, tobacco, rice, corn, and luscious tropical fruits. Higher up in the temperate plateau grow wheat, oats, corn, barley, potatoes, and other vegetables, but only enough for home consumption. The resources of the prolific forest region of the eastern lowlands are largely undeveloped, but here are inexhaustible supplies of rubber, vegetable ivory, dyewoods, and cinchona bark, from which quinine is made.

In metals Ecuador is much poorer than its neighbors Colombia and Peru, although there are several gold and silver mines, and iron, lead, platinum, and quicksilver are found. The oil fields are being worked on a small scale, but there has been little attempt to work the coal deposits. Development of the mineral and agricultural resources has been retarded by the lack of communications. Most of the transportation is by mule trains along rough and dangerous mountain trails. Only about 400 miles of railway have been built, the chief being the picturesque and difficult line connecting Guayaquil and Quito. About 600 miles of navigable rivers furnish transportation.

Excluding the islands, Ecuador's area is estimated at about 116,000 square miles, and its population at something under 2,000,000. About two-thirds are native Indians, and about a quarter "mestizos," of mixed Indian and Spanish blood. The system of land monopoly, with the accompanying evil of peonage and debt servitude, has kept the natives and a large proportion of the "mestizos" poor, ignorant, and degraded. The gulf between the whites and the colored population is more marked in Ecuador than in most other South American republics.

The Stormy History of Ecuador

The history of Ecuador has been stormy to a degree exceptional even among the turbulent states of South America. Conquered in 1534 by lieutenants of the Spanish adventurer Pizarro (*see* Pizarro, Francisco), the country was administered under the Spanish viceroyalty of Peru. From 1809 to 1822 there were several efforts to shake off Spanish rule, culminating in 1822, when one of the generals of Simon Bolivar, the "liberator of South America," finally defeated the forces of Spain (*see* Bolivar, Simon). Ecuador was at first incorporated with Venezuela and Colombia, but became an independent republic in 1830. Since then its constitution has been changed no less than eleven times. Bitter quarrels, insurrections, and political murders have been frequent. The constitution of 1904 put all religions on an equal footing and seized the great possessions of the church. The government is a centralized republic, in which the governors of provinces, departments, and municipalities are all appointed by the executive. Senators and deputies are elected by direct vote of all male citizens over 21 who can read and write.

EDDY, MARY BAKER (1821–1910). The distinction of being the only woman to establish a great religious faith belongs to Mary Baker Eddy, the founder of Christian Science. Born on a farm near Concord, N.H., Mary Baker was a beautiful but delicate child, thoughtful and deeply religious. In her early womanhood she married George W. Glover, and went to live in Charleston, S. C., but in about a year her husband died, and she returned to her parents' home.

MARY BAKER EDDY
The Founder of Christian Science

For many years her health was delicate, and in her distress of mind and body she turned to the Bible for consolation. Gradually there came to her the conviction that God is infinite Spirit or Mind, the divine Principle of all real being, and that since He is infinitely good, there can be no real evil. What we call sin, sickness, and death are only errors of mortal mind, and when these errors are destroyed, mind and body are healed.

"The falling apple," as she herself expressed it, which after 20 years of seeking led to the discovery of the Principle of Christian Science, was an accident from which she recovered in a seemingly miraculous manner. On the third day after her injury, when she lay apparently at death's door, she called for her Bible, and read the account in Matthew ix of how Jesus healed the palsied man. Then, in her own words, "As I read, the healing Truth dawned upon my sense; and the result was that I rose, dressed myself, and ever after was in better health than I had before enjoyed." ('Miscellaneous Writings', p. 24.)

This was in 1866. Then followed years of profound thought and study of the Scriptures, the results of which were given to the world in 1875 in her book, 'Science and Health with Key to the Scriptures', the textbook of Christian Science.

Among the little group of students who had gathered around her was a grave, sweet-tempered man named Asa Gilbert Eddy, whom she shortly afterward married. He lived only five years after this, but he was of great help to Mrs. Eddy in the early and troublous years of the Christian Science movement.

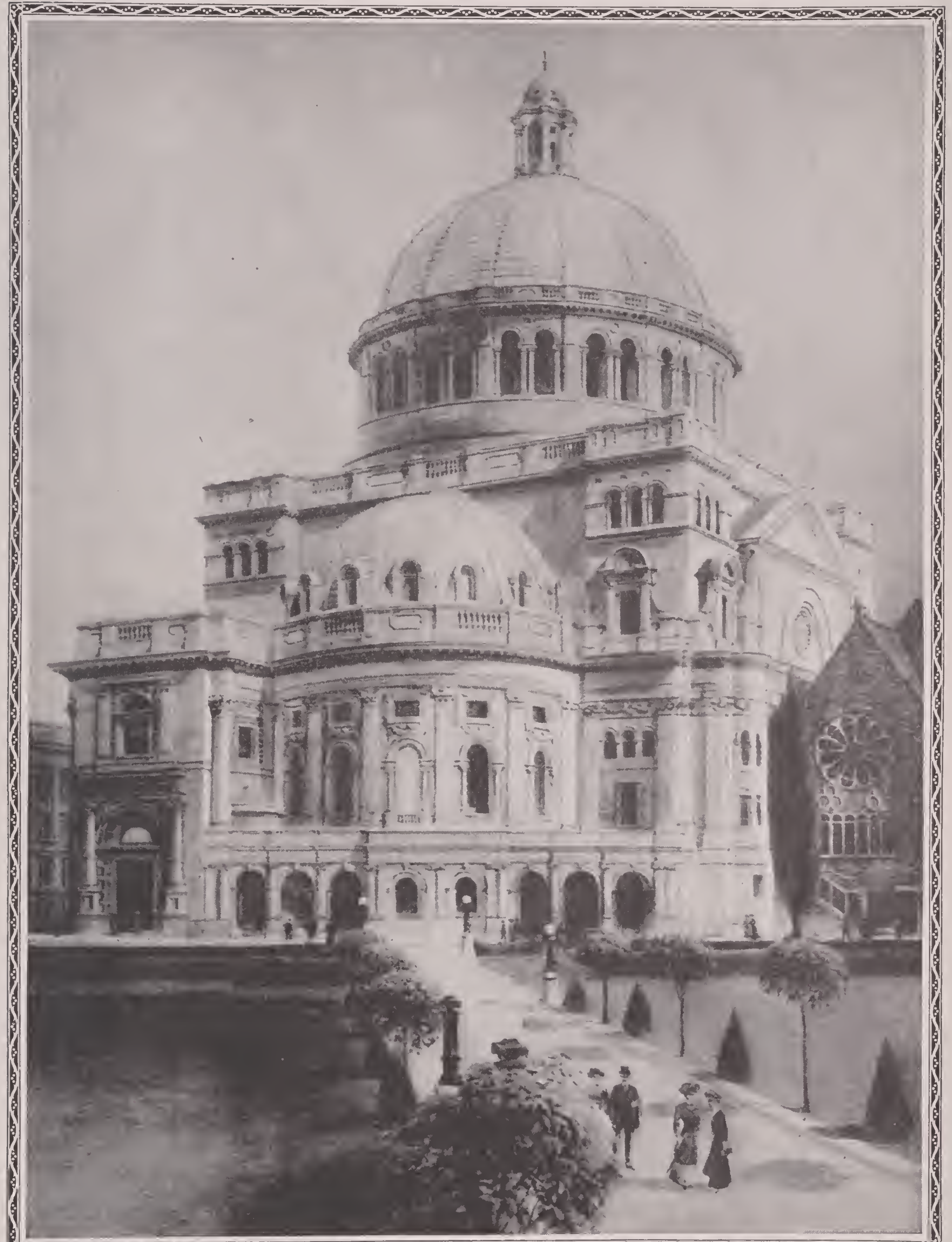
In 1879 Mrs. Eddy organized the church in Boston, which came to be called The First Church of Christ, Scientist. From this "Mother Church" branches quickly spread to all parts of the United States and even to foreign countries. For many years after her husband's death, Mrs. Eddy continued to lead a very busy life, teaching large numbers of students, editing *The Christian Science Journal*, and inspiring eager congregations. Although her last years were spent in retirement at "Pleasant View," her home in Concord, and at Newton, a suburb of Boston, she remained the active leader of the Christian Science movement until she quietly passed away in 1910 in her 90th year.

EDINBURGH (*ĕd'ĭn-bŭr-ō*), SCOTLAND. Frowning Castle Rock, a bold precipitous height of 430 feet, dominates the capital city of Scotland, as the Acropolis dominates Athens. This circumstance, together with the city's intellectual and political prominence, makes Edinburgh's title "the Athens of the North" more appropriate than such nicknames usually are. The rock is surmounted by a massive medieval castle which was the ancient seat of the Scottish kings.

From this height you see one of the most picturesque scenes in all Europe. On three sides the rock drops sheer to the valley below. To the east along a narrow ridge runs "The Royal Mile" (High Street and Canongate) to Holyrood Palace, on the edge of King's Park with Arthur's Seat like a crouching lion. In this historic palace once dwelt unhappy Mary Queen of Scots and others of the Scottish royal line. To the south of the Royal Mile lies the quaint Old Town, familiar to all readers of Scott's romances. Many of the old houses which line the "closes" of this quarter are remarkable for their height—"bee hives ten stories high," as Robert Louis Stevenson called them. At the foot of Castle Rock to the north are the beautiful Princes Street Gardens, filling the narrow ravine; and beyond them rises the New Town, with its massive modern buildings and its splendid commercial streets. Princes Street, bordering the Gardens on the north, is accounted by many travelers as one of the finest streets in Europe.

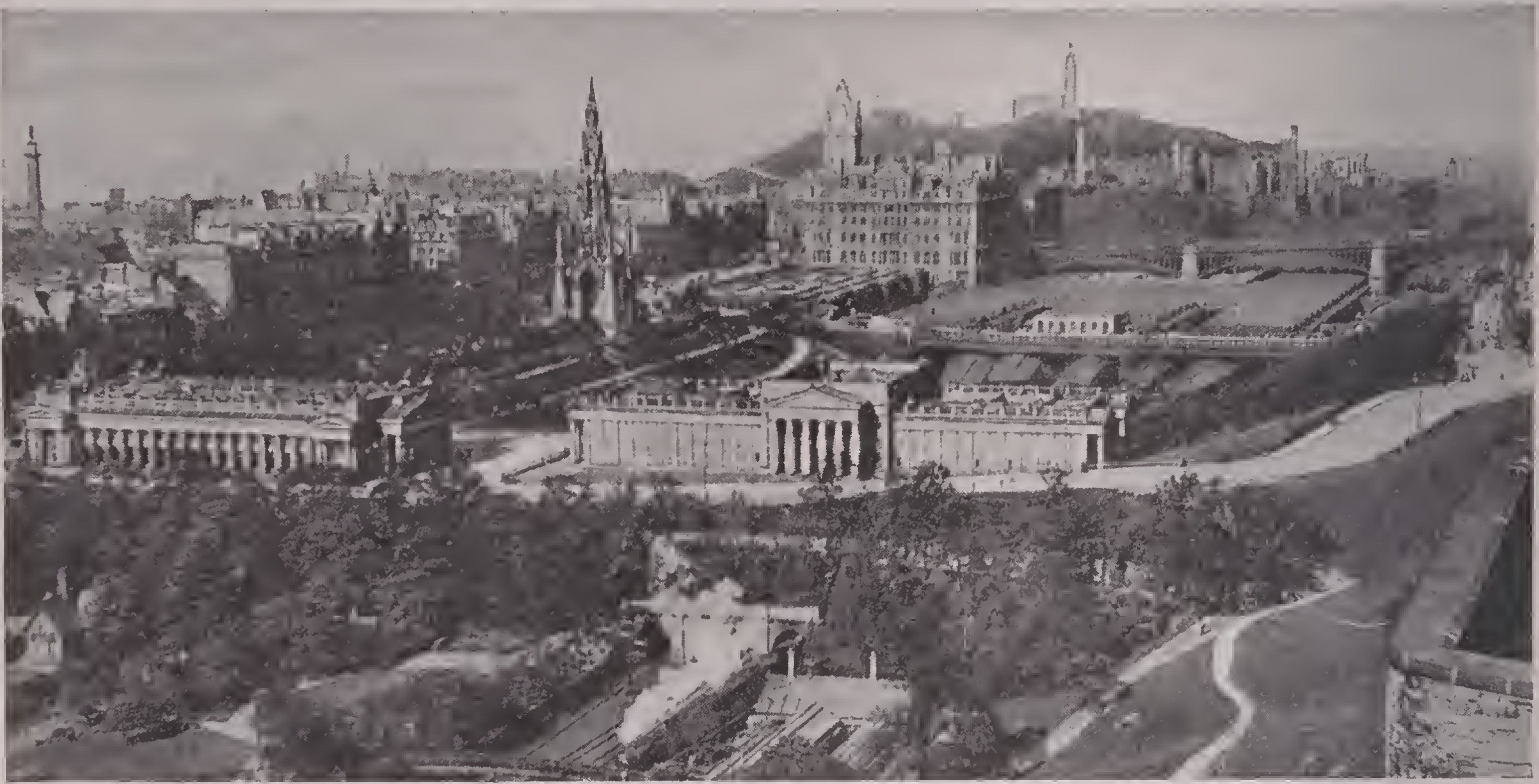
Reminders of a long and illustrious past everywhere meet the visitor's eye. In Queen Mary's room in the Castle was born James I of England (1566). In Holyrood Palace are many relics of the queen, and a brass plate in the vestibule of her audience chamber marks the spot where her favorite Rizzio was assassinated. In St. Giles's Church (built 1385–1460) John Knox, the great religious reformer, often preached; and not far away is the quaint old stone house with its projecting front where Knox once lived. The University, founded in 1582, is one of the most famous in Europe and the list of its members contains some of the most celebrated names in British history and letters. The Parliament House, once the seat of the Scottish Parliament but now occupied by Scotland's supreme law courts, is rich in memories of Sir Walter Scott,

THE MOTHER CHURCH OF THE CHRISTIAN SCIENCE FAITH



This magnificent structure in Boston is the parent church of the Christian Science faith. As you can see from the picture, it is one of the most beautiful buildings in America, and its architectural style has been followed in many of the Christian Science churches throughout the country. The full title of the church is "The First Church of Christ Scientist."

LOOKING ACROSS THE HEART OF EDINBURGH FROM CASTLE ROCK



The street running across the middle of the picture, with a railway tunnel passing underneath it, follows along a high embankment called the Mound, which connects the two parts of the city. Fronting on the street are the National Gallery on the right, with the Waverley Station behind it, and the Royal Institute on the left. Behind the Institute is East Princes Street Gardens, with the Sir Walter Scott monument in the middle. Along the left-hand edge of the park runs Princes Street, the principal thoroughfare of Edinburgh. Behind the large hotel in the middle of the view rises Calton Hill.

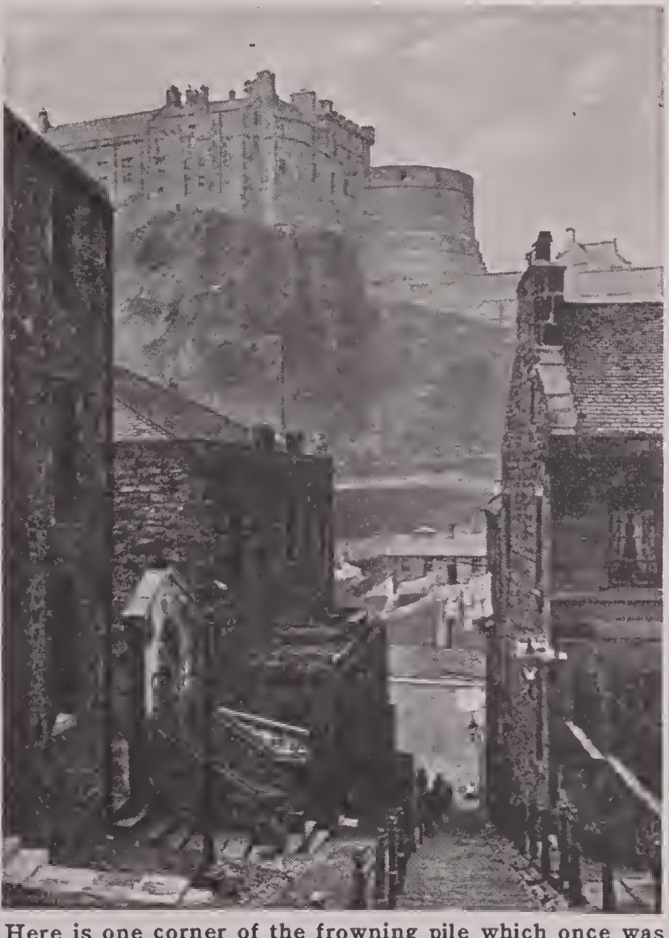
who spent more of his time poring over old manuscripts in the famous Advocates' Library than in seeking clients or pleading their causes. To his memory has been erected what is perhaps the world's finest monument to literary genius. This stands in the East Princes Street Gardens and consists of a 200-foot Gothic spire of red sandstone in whose niches are statues of the famous characters in Scott's writings. Under this elaborate canopy is a fine marble statue of Sir Walter himself, with his favorite dog. A Carnegie library gives the city a touch familiar to Americans, and this Scotch-American millionaire gave largely also to the University.

Among the famous side-trips you will take when visiting this city are the ones to Abbotsford, Scott's castle-like home on its terrace above the Tweed; to Burns' little thatched cottage near Ayr; and the interesting but less romantic one to the remarkable bridge spanning the Firth of Forth near Edinburgh, a bridge which is one and a half miles long, cost more than the United States Capitol at Washington, and is one of Scotland's greatest engineering wonders.

Edinburgh, despite its nickname "Auld Reekie" ("old smoky"), is not much of a manufacturing center. Brewing, printing, and glass working are its chief industries. Like its sister city Glasgow, 47 miles to the west, it has a progressive municipal government.

Edinburgh was settled before Roman times. In the 7th century, when the Angles of Northumbria seized it, it was named after their king "Edwin's burgh." Their occupation of the site was marked by the erection of the first fortress to occupy the "Castle Rock." In the 10th century the town was seized by the Scots, and from then on its history consists largely of struggles between Scots and English for its possession until 1437, when it became the Scotch capital. The English destroyed the town in 1544, but it was soon rebuilt. Population, about 327,000.

EDINBURGH'S HISTORIC CASTLE



Here is one corner of the frowning pile which once was the home of the kings of Scotland. Portions of the building are now used as a museum and are open to the public.

Hilda Hanway

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